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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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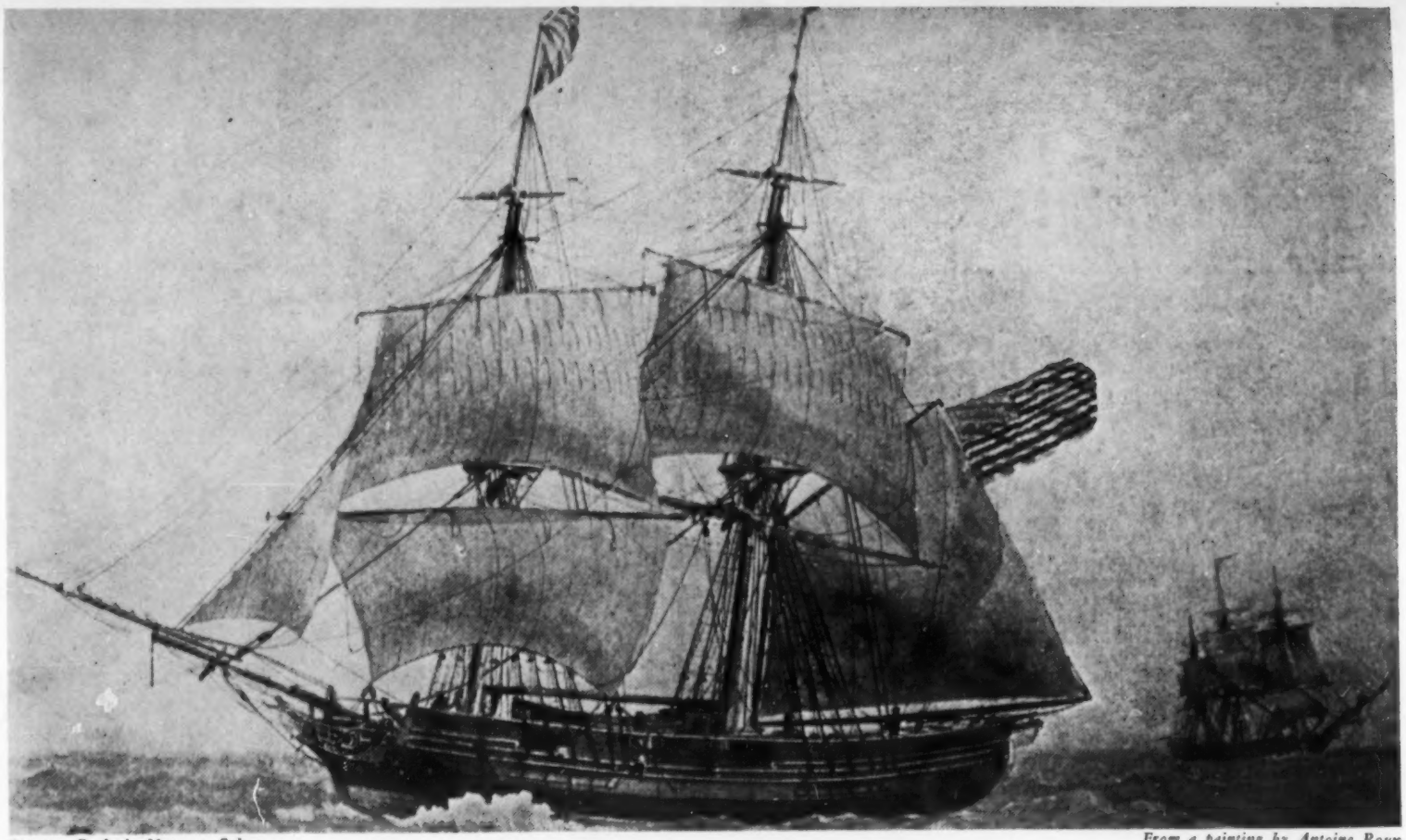

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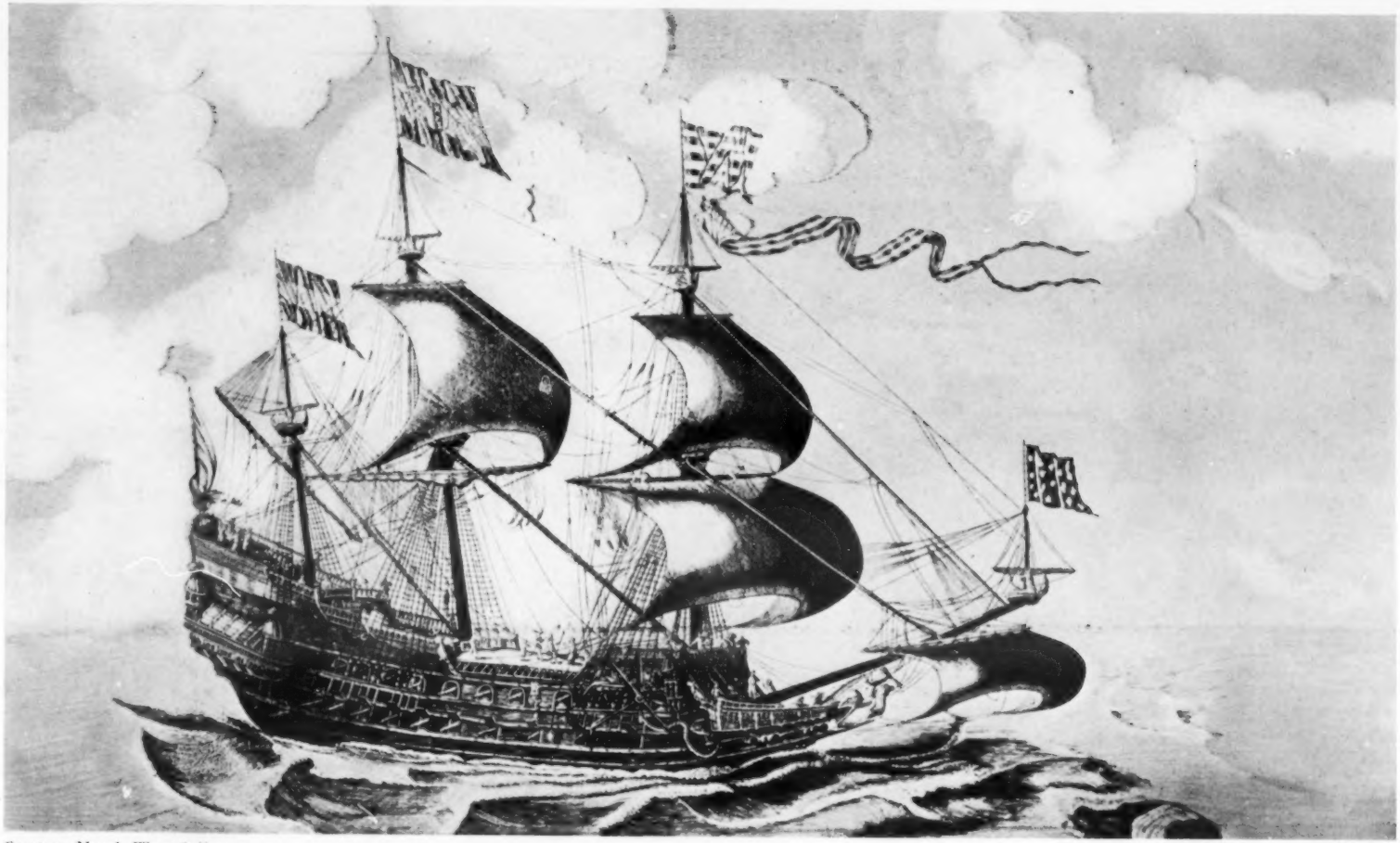
BRIG *MARIA* OF BOSTON, JOSEPH SAUNDERS, MASTER



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A TYPICAL DUTCH WARSHIP OF THE EARLY SEVENTEENTH CENTURY

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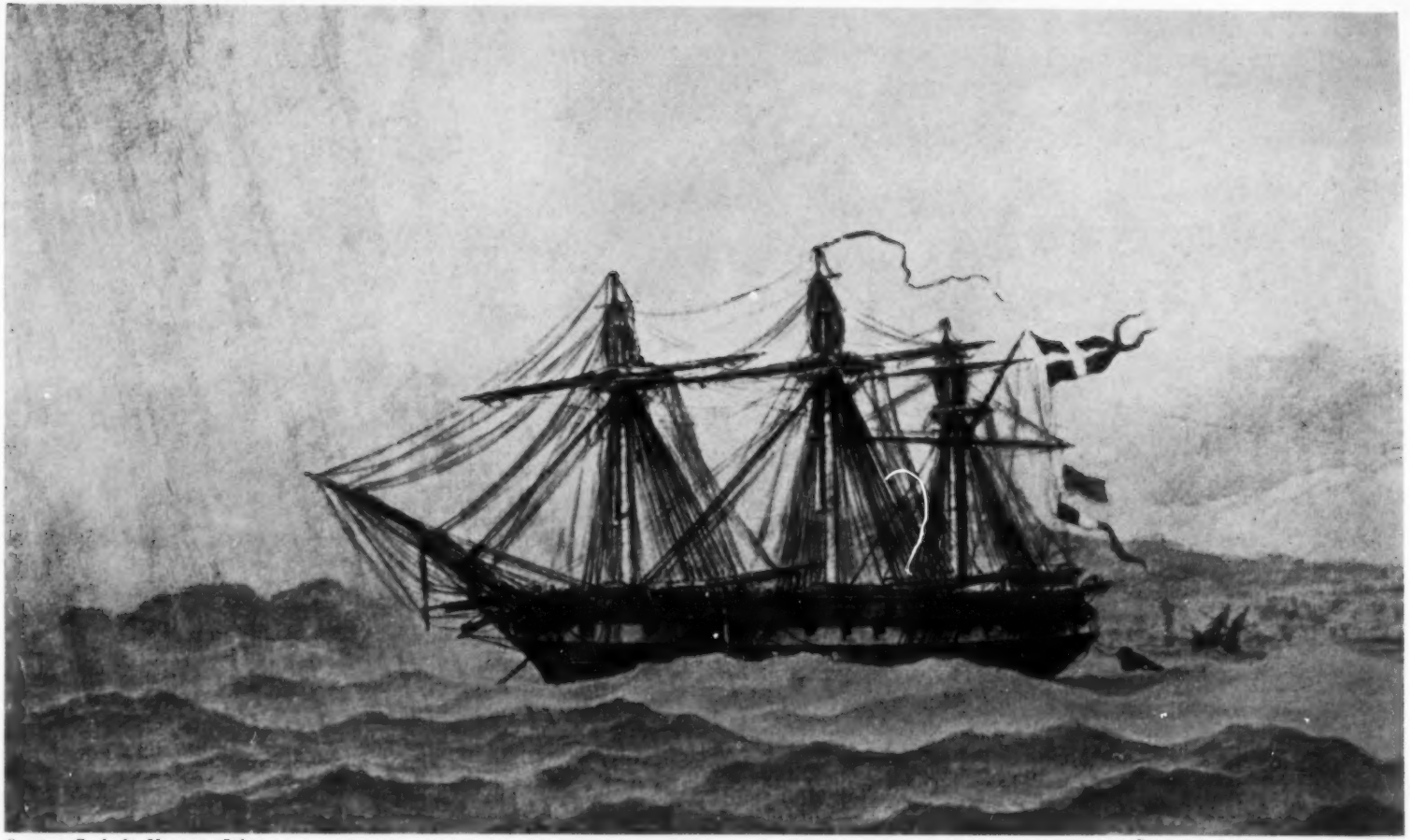

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FRENCH FRIGATE RIDING OUT A STORM

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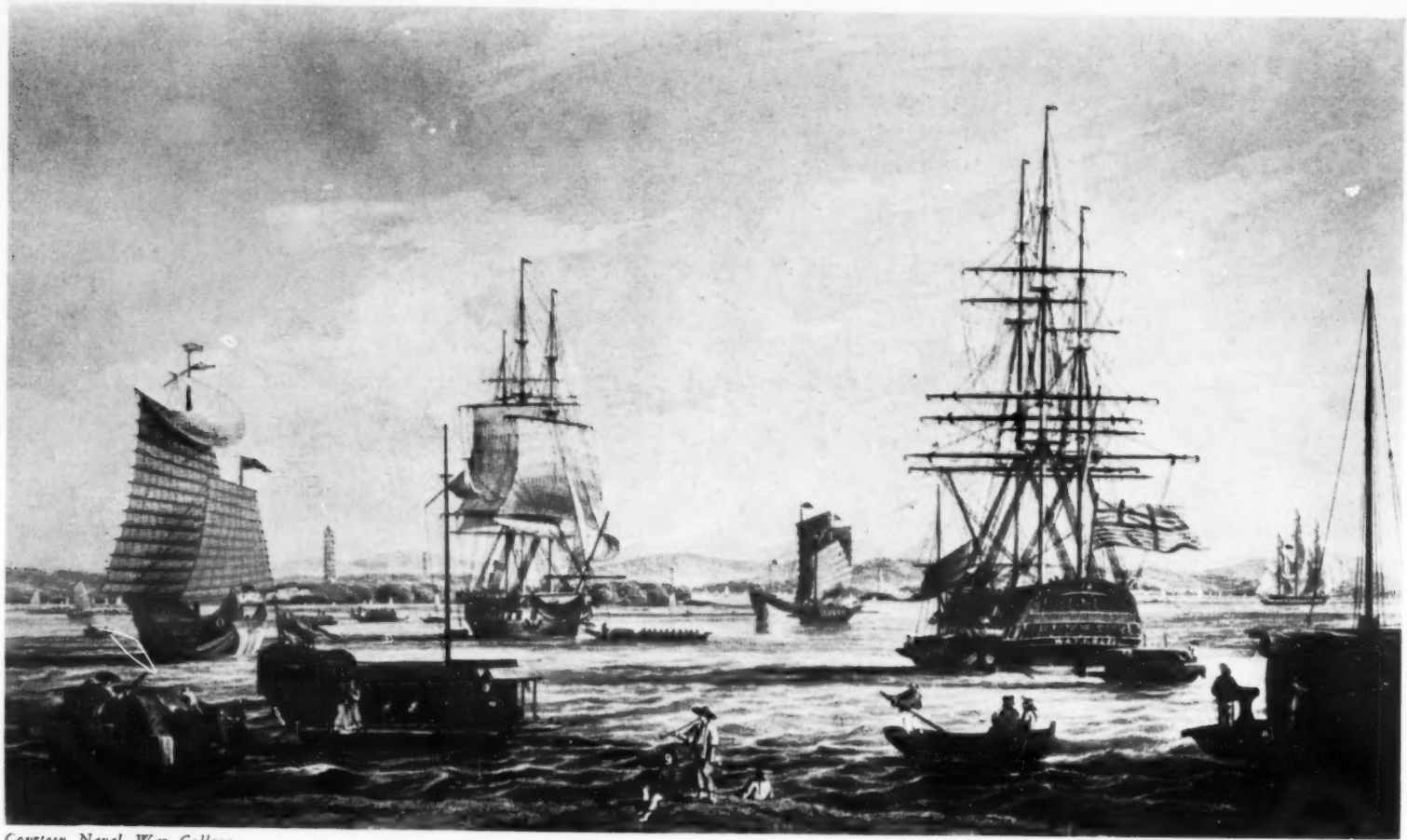

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WHAMPOA, CANTON RIVER, ANCHORAGE OF THE EAST INDIA COMPANY'S SHIPS

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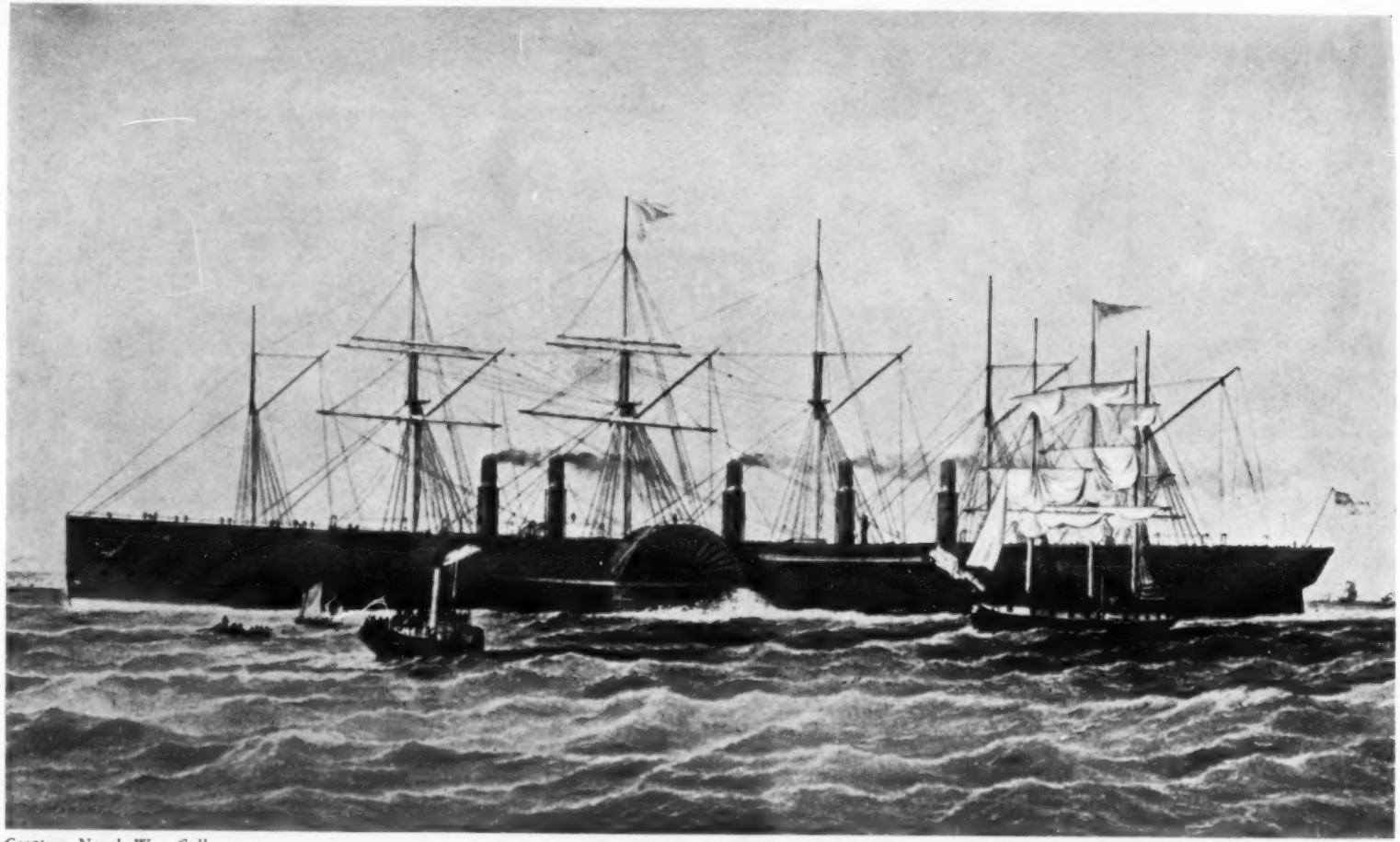

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STEAMSHIP *GREAT EASTERN*

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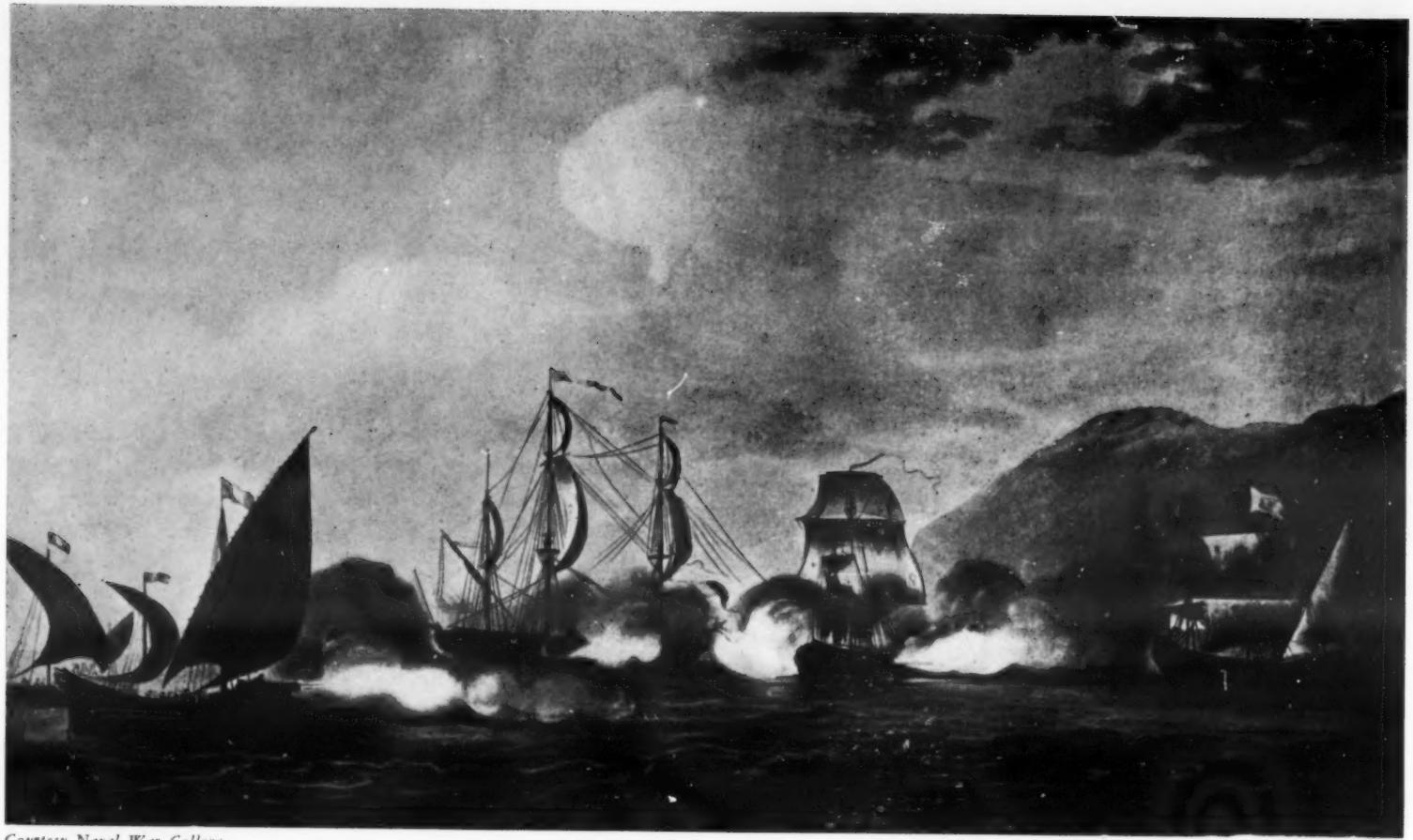

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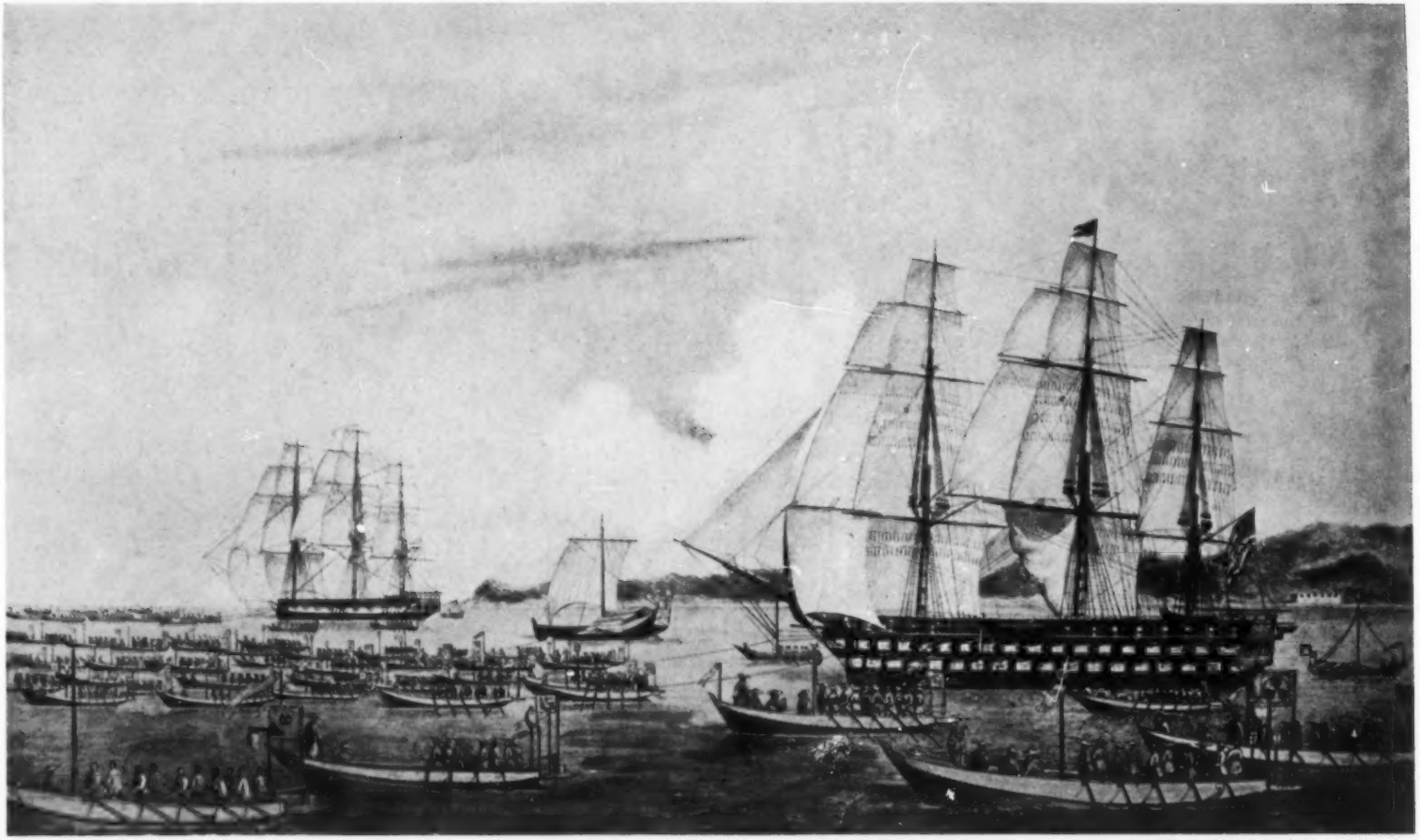

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THE U. S. SHIPS *COLUMBUS* AND *VINCENNES* LEAVING JEDO BAY, JULY 29, 1846

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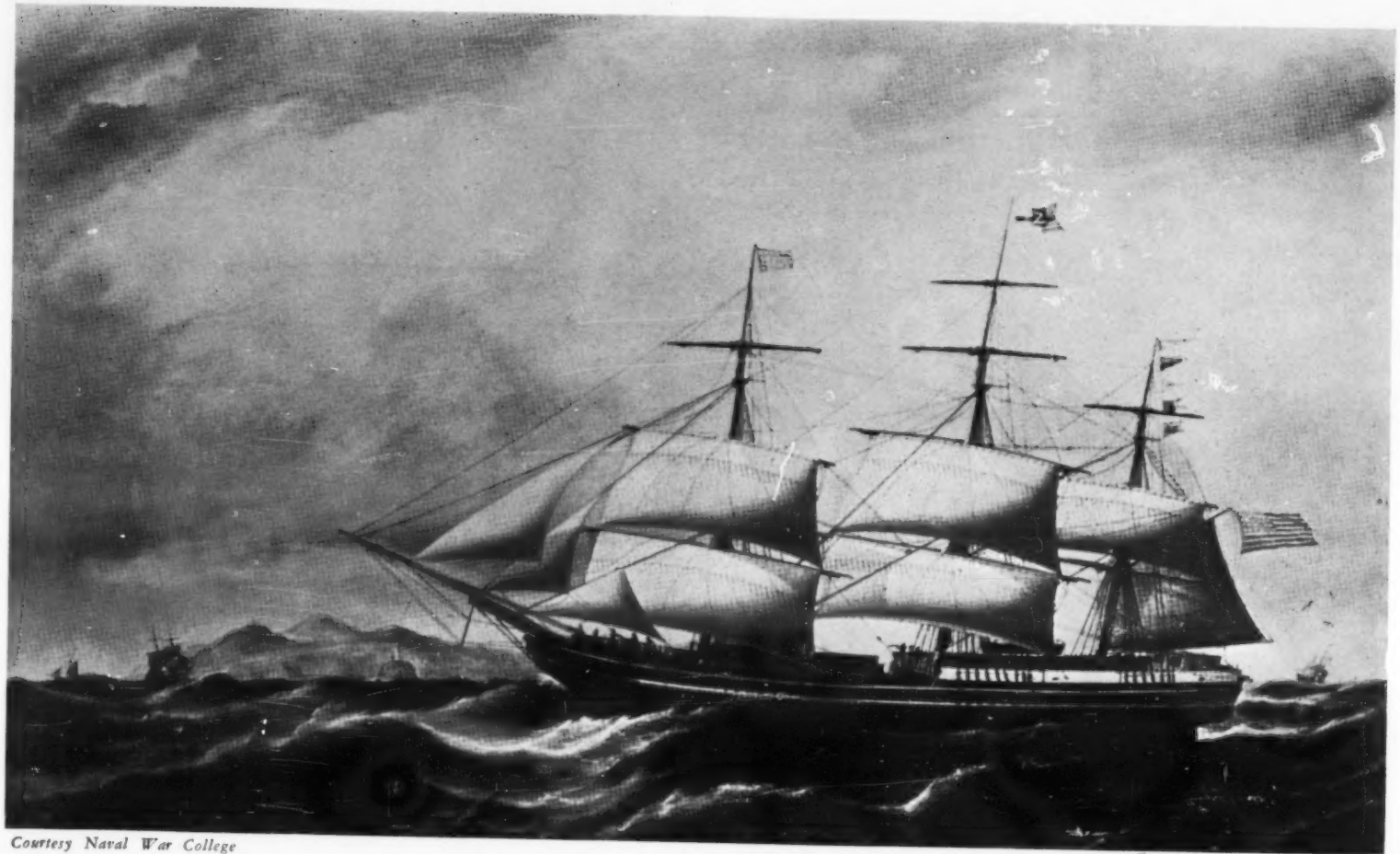

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THE AMERICAN CLIPPER SHIP *ANTARCTIC* BUILT BY DONALD McKAY

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THE AMERICAN CLIPPER SHIP *ANTARCTIC* BUILT BY DONALD McKAY

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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

VOL. NO. 57, NO. 1 JANUARY, 1931 WHOLE NO. 335

NAVAL AIRCRAFT IN COASTAL WARFARE

BY COMMANDER H. H. FROST, U. S. NAVY

IN EARLY warfare there was little distinction between military and naval forces. An Athenian *strategos* might command either on land or sea. His heavily armed hoplites might fight either in a densely ranked phalanx ashore or upon the decks of swiftly rowed triremes. These frail galleys had to be drawn up at night on sandy beaches. Often one fleet attacked the other before its ships could be launched, and the resultant battle was fought more on shore than at sea.

The Norsemen, some twelve centuries later, still fought this style of amphibious warfare. The same warriors who might fight a sea battle behind the serpent-shaped figureheads which decorated the prows of their galleys might next day go berserk in a pitched battle ashore or scale the walls of a fortress.

The Spanish sea power of the sixteenth century was merely an extension of their military power to the sea. Their ships were commanded and fought by soldiers. Their fleets were led by generals. The mariners and pilots who worked the sails and manned the tillers of their clumsy galleons were mere menials who did as soldiers ordered. These tasks were considered beneath the dignity of Spanish fighting men.

The British and Dutch, on the contrary, wanted no soldiers on their ships. They built up naval services which had no connection whatever with their armies. From that time, four centuries ago, all great powers have realized the necessity for having both military and naval services. In some countries geographic conditions have given priority to one service or the other. In our country the Army and Navy have been considered of equal importance. That is the best policy.

The functions of the two fighting services have been quite distinct. In general, the Navy operates on the water and the Army on land; although on occasion there have been exceptions to this general principle.

You will note that the Navy fights on the water. Not only on the high seas have our sailors fought, but wherever there has been enough water to float their ships. In 1813 Commodore Perry won the permanent command of Lake Erie and permitted General Harrison to invade Canada. Commodore Chauncey gained the temporary command of Lake Ontario on various occasions and allowed General Pike to capture Toronto. In 1814 Commodore Macdonough won a decisive victory on Lake Champlain and compelled the retreat of an immensely superior British invading Army. In 1815 Commodore Patterson with a few ships in the Mississippi gave a helping hand to Andrew Jackson at New Orleans.

In the Civil War the Army tried the experiment of building and operating a gunboat flotilla on the Mississippi. Naval officers were loaned to command the ships. But this was not enough. A year's time conclusively demonstrated that the military service was not fitted to operate a force on

the water. By act of Congress the entire flotilla was transferred to the Navy Department and organized as a naval force. Under Admiral Porter it coöperated with General Grant in the famous campaign which resulted in the capture of Vicksburg. Farragut ran the Mississippi forts and captured New Orleans. Pensacola and Mobile fell. Flotillas pushed their way into North Carolina and Virginia waters and penetrated far up their rivers.

Wherever there was water, be it salt or fresh, broad ocean or narrow river, the Navy went hand in hand with the Army Each was necessary to the other. As Commodore Foote said, they were like the two blades of a pair of shears. Each was helpless without the other in these coastal and inland operations. In the Spanish war our Navy, in addition to defeating the Spanish fleets at Santiago and Manila, protected the passage of Army expeditionary forces to Manila, Cuba, and Porto Rico. It assisted their operations, landed their supplies, protected their lines of communication, attacked and blockaded the enemy coasts, and patrolled our own coast line.

When we entered the World War the German High Seas Fleet was so inferior as to give it little hope of success in battle. As a last desperate resort, unlimited submarine warfare against merchant shipping had been commenced. The phenomenal successes of the German submarines produced a situation very dangerous to the success of the allied cause. They threatened the very existence of Great Britain. Attention should be focused on the fact that this fierce submarine campaign was fought almost entirely in the coastal waters of Great Britain and France and to a lesser degree in those of Italy, Portugal, Greece, and the United States. The submarine offensive was defeated not by the battle fleets of the allied powers, but by other naval forces spread along their coasts with the specific mission of protecting allied shipping in the coastwise sea lanes. Our destroyers, submarines, and small patrol craft, based on Queenstown, Brest, and Gibraltar, played a primary part in this protection of allied shipping, which included the supply ships and transports necessary for building up our great army of two million men in France. For two years this difficult problem was equally important to that of defeating the German High Seas Fleet. This might not have been the case had the two fleets been more nearly equal in fighting strength.

When we entered the war, aircraft already had demonstrated their usefulness in the bitter antisubmarine campaign being waged by the Allied Powers. Our government decided that we should devote special attention to this new antisubmarine weapon. As it operated over the water and against hostile naval craft its development and use was made a function of the Navy. While the twin-pontoon seaplanes and large flying boats were being developed for coastal patrol, their pilots were being trained at Pensacola, Miami, and Key West. Coastal patrol stations were established in England, France, and Italy. Our aircraft operated from them with excellent effect.

In addition to seaplanes and flying boats, lighter-than-air craft came into use. Small nonrigid blimps patrolled the coastwise sea lanes and escorted convoys of shipping along these coastal routes and into the great base ports. Kite balloons were towed above patrol craft and escort vessels. American naval aircraft played a large part in beating the submarine in European waters.

At home also we established coastal air stations to be prepared when the submarine should pay us her expected visit. These stations were under the commandants of the six naval districts among whom the responsibility for protecting shipping in our Atlantic coastwise sea lanes was divided. The aircraft based in these stations acted in close conjunction with the other naval district forces: submarines, destroyers, submarine chasers, mine sweepers, and other patrol craft. In addition to protecting the coastwise shipping, they escorted all convoys leaving our ports for Europe until they were well out to sea. These convoys carried the sinews of war to our Army in France and the detachments of our fleet in European waters.

The Navy Department long feared an attack upon the shipping carrying fuel oil from the Gulf of Mexico up through the Florida straits to American or European ports. It therefore established a special force of some twenty-five cruisers, gunboats, yachts, and submarine chasers, which based at Key West.

The admiral commanding this detachment, on whose staff the writer served as

senior aide, carried out a long series of maneuvers to develop the tactics of aircraft, surface vessels, and submarines in antisubmarine operations. The aircraft at Key West were manned by Naval Reserve personnel of the highest caliber, but entirely without naval experience. There was not a single regular officer at the station. Pilots and observers at first could not distinguish between the various types of naval and merchant craft. They knew little of the capabilities and limitations of surface craft and submarines. Their planes had no means of communication with them. However, as their training with the surface craft of the patrol detachment and the submarines of the Seventh Naval District progressed, they rectified these deficiencies. They became, in fact, an essential part of the naval forces responsible for the defense of the vital lines of shipping which run through the Florida straits bottle neck. Had German submarines ever attacked that vulnerable coastwise route, they would have encountered well-trained naval forces in the air, on the surface and under the water—forces able to act alone or as part of a fighting team. Had it been proposed that Army planes—unable to alight on the water and manned by pilots and observers entirely unfamiliar with naval vessels and tactics—should assume the duties of our naval aircraft along the coast in addition to their own military functions, it would have been treated as a huge joke.

Nevertheless, only two years later this very joke was perpetrated on the House of Representatives. In the Army Appropriation Bill for 1920 there appeared an apparently innocuous sentence, which later became known as the "Mitchell joker." It read:

> That hereafter the Army Air Service shall control all aërial operations from land bases, and that naval aviation shall have control of all aërial operations attached to a fleet.

This was one of the opening moves of a carefully prepared campaign to reduce the Navy to a submarine force and to establish a separate air service. At that time we had no aircraft carriers and there were only a few planes attached to the fleet. Practically all our naval aircraft were operating from shore bases. Had this joker become law, nearly all our naval air service would have been abolished or transferred to the Army.

As the Navy Department does not ordinarily keep close touch with the amendments to the Army Appropriation Bill, this attempt to legislate its naval air service out of existence was not discovered until the move had gained considerable headway. When it finally came to light a controversy of large proportions arose. Naturally much ill feeling resulted from the attempt of a subordinate officer to engineer through Congress a restriction against another department—and this entirely without the consent or even knowledge of his own secretary. The Secretary of War admitted the impropriety of such conduct and stated that he had taken action to prevent a recurrence. An amendment was attached to the appropriation bill joker. While this was subject to a number of interpretations, it had the effect of nullifying the restrictions originally placed upon the naval air service.

General Mitchell, undaunted by this initial repulse, continued his agitation. Finally, he openly attacked the Navy Department. As a result he was convicted and sentenced by military court-martial. He resigned from the Army. The controversy ended.

During these years there was continual discussion between the Army and Navy as to the functions of Army and Navy aircraft. While the determination of these functions where land meets water has always been an involved problem, their discussion in the joint planning committee and joint board was most frank and amicable. The joint board has issued a series of decisions from 1920 to 1928. In addition to setting forth the functions of both air arms, the joint board has approved the five-year air programs for Army and Navy and has certified that they involve no duplication. While exception can be taken to individual points, these decisions have been, on the whole, eminently satisfactory. As they involve compromises between two opposing viewpoints, some dissatisfaction has been voiced, but this counts for little when compared with the good feeling which existed between the two departments for many years.

In this year, however, the entire question of the use of aircraft along our coastwise sea lanes and in the vicinity of our outlying possessions has been revived. A correct so-

lution of this problem is vital to our national defense. Unfortunately, this is a highly involved technical question. Let us glance briefly at the salient points and reduce the problem to its simplest terms.

Aviation is essential to both Army and Navy. Its addition to the two services does not change the old rule that the Army fights on the land and the Navy on the water. But the fact that aircraft can operate over both land and water makes necessary a somewhat freer interpretation. It is impossible any longer to draw a dividing line at the water's edge. Instead of this narrow line, let us imagine a dividing band extending on the one hand twenty-five miles inland from the coast line and on the other twenty-five miles out to sea. The water outside this zone we may quite definitely assign to naval aviation. The land inside it may be given equally definitely to military aviation. The 50-mile band is covered by both naval and military aviation.

To illustrate these ideas a little more concretely let us visualize a war fought along or near our coasts and frontiers. In such a case practically all our naval forces must be concentrated into the United States Fleet to oppose the main fleet or fleets of the enemy. In the same way the greater part of our military forces must be concentrated into one or more mobile armies to oppose the hostile armies. But neither Army nor Navy can afford to neglect altogether those parts of our coasts and frontiers which are not directly threatened by the principal enemy forces. Also, due provision must be made for the security of the Panama Canal—even though it be not so menaced.

There are four main reasons why:

(1) The fleet itself requires security against harassing attacks while in its bases, while entering or leaving them, and while cruising along the coastwise sea lanes.

(2) The lines of communications for our fleet run along the coastwise sea lanes. Fuel oil, a most important item in the fleet's supply, is largely transported along these coastal routes.

(3) There is valuable merchant shipping running along the coastwise sea lanes and from them to the Panama Canal. Through this canal we maintain an important intercoastal trade and keep open contact with many foreign countries.

(4) There are valuable and vulnerable military, naval, and industrial facilities along and near the seacoast and at the Panama Canal. How may the enemy attack these four important objectives?

(1) Cruisers may attack our merchant shipping or naval auxiliaries along the coasts or en route from the Panama Canal, destroy inferior surface craft attached to the naval districts or the fleet, lay mines along the coast or off the canal, and bombard undefended ports.

(2) Carriers may launch air bombing squadrons to attack our fleet in port or near the coast, naval or military establishments on or near the coast, important coastal cities, or the Panama Canal.

(3) Submarines may attack merchant shipping or naval auxiliaries along the coasts or en route from the Panama Canal, torpedo important units of the fleet, and lay mines along the coast or off the canal.

(4) Specially prepared merchant vessels may be sunk in the approaches to coast ports or the canal to block the channels.

(5) A military expeditionary force, supported by a detachment of the fleet, may attack the Panama Canal with a view to its permanent occupation. It is possible, but highly improbable, that such an attack might be launched against a minor objective on our coasts with a view to temporary occupation and demolition of military or naval facilities. Any attempt at permanent occupation of territory along our coasts is almost inconceivable.

To counter these widely varied forms of attack two measures are necessary: (1) they must be detected; (2) they must be repulsed or evaded.

To perform these dual missions the naval districts along our coasts and at the Panama Canal will have very limited numbers of destroyers and submarines and considerable forces of aircraft, patrol vessels, and mine sweepers. These forces will be assisted by an extensive system of lookouts along the coast and a complete communication service, including numerous radiocompass stations. In case of necessity, reënforcements will be sent from the fleet.

The Army Corps Areas will have fixed and mobile coast defense batteries, antiaircraft batteries, fields of electrically controlled mines at important harbors, coastal aircraft, and possibly several divisions composed of mobile troops of all arms. The

latter, except at the Panama Canal, will probably be in process of mobilization and available only in case of emergency for countering serious enemy attacks.

It is obviously necessary to detect hostile attacks as early as possible. A submarine patrol off the enemy bases will be useful for observing and reporting the exit of large hostile forces. While this is an indication of the time and strength of a possible serious attack, it gives little or no idea as to where it will strike. As there will be continuous movements of small detachments and individual ships about the hostile bases, the information which our observing submarines may gain of minor attacks will be too vague to use as a basis for protective measures.

Thus we must rely primarily upon a patrol of the coastal waters themselves to detect hostile attacking forces. This patrol must be carried far to sea, so that measures may be taken to counter the attack before it reaches its objectives. This is specially important when we have to deal with air attacks launched from carriers, cruiser raids on shipping, surprise bombardments or mining operations. In such cases the attacking forces would approach the coast under cover of darkness at high speed and commence operations at, or even before, daybreak. It evidently would be highly desirable to locate the enemy before he commences his night run toward the coast. It is essential that he be located at dawn or immediately thereafter. Our patrol should extend at least 300 miles from the coast. In the approaches to the Panama Canal it should be even farther advanced. To detect submarine operations or blocking and landing attacks, such advanced warning is not required because of the slower speed of the enemy forces, but a continuous daylight patrol extending out at least 150 miles from the coast is necessary. The failure of the Germans to detect the British attack on Zeebrugge proves this. A further form of coastal patrol is the screening of the fleet when under way in coastal waters and the escort of convoys of merchant shipping and naval auxiliaries along the coast.

It would be impossible to maintain such overwater coastal patrols with surface craft alone. The number of ships to make them effective would be enormous. Even if the ships could be obtained, it would be out of the question to maintain them so dispersed over the ocean in the face of hostile attacks. Aircraft have solved this important problem of coastal patrol. Due to their high speed they can cover far more area than surface craft. They are practically immune from hostile attack. In clear tropical waters they can detect submarines completely submerged or even fields of mines. They require smaller operating personnel and can be built more quickly and at less expense. Many commercial aircraft are available for rapid conversion into naval patrol planes. Aircraft therefore are perfectly suited for coastal patrol and essential to its efficiency.

Once an attack is detected by patrolling craft, it must be repulsed before it can reach its objective or the objective itself must evade the attack. It will naturally be advantageous for the patrolling craft discovering the enemy to attack him. This results in the attack being delivered quickly, surely, and often with the aid of surprise. If the enemy craft be a submarine it is obvious that only the patrolling craft which sights her has any chance of making a successful attack. If other air or surface craft have to be summoned to the spot to attack, the submarine has several hours to make off under the water and she must again be located, probably with listening devices. Also, if the hostile craft be an aircraft carrier about to launch an air bombing attack from her decks, it is obvious that the best chance of defeating such an air attack is to damage the flying deck before the planes can take off. This can be done only by the patrolling craft which has made contact.

As our patrol will consist principally of aircraft, it is important that they should have means of attacking enemy craft when detected. Their most effective weapons are bombs. Naturally a plane used for offshore patrol must devote its load mostly to gasoline. But it will still be able to carry several small or medium bombs which would cripple a submarine or injure a carrier's deck. It would be nothing short of folly to prohibit the patrolling planes from carrying a load of light bombs effective against submarines, destroyers, aircraft carriers, and cruisers, and thus prevent these planes from taking advantage of opportunities for surprise attack.

Frequently the enemy force located will be too powerful for a single patrol plane to

attack. Then it is the plane's duty to maintain contact as long as possible and continuously report the movements and dispositions of the enemy. For this purpose it must have a good radio set and defensive machine gun armament. The naval district in which the contact has been made will fix continuously the positions of the contact plane—and consequently of the enemy—by means of its radiocompass stations. This information, together with the strength and disposition of the enemy force, will be broadcasted to all coastwise shipping so it can seek shelter in port or otherwise evade the enemy.

A striking force must then be organized to attack the hostile detachment. If this attack has to be delivered some distance at sea, say 150 miles, aircraft will be the only type available for immediate use. As the planes formerly used for patrol now have only to go to a definite locality, attack and return, they can reduce their load of gasoline below that required for patrol duty and substitute a formidable armament of bombs. If some of them are equipped for launching torpedoes, a peculiarly naval method of attack, this will be advantageous. These aircraft may be reënforced by the patrol planes of adjacent air stations or even by planes launched from the aircraft carriers or cruisers of the fleet. Such air attacks should be effective against all but the strongest hostile forces.

The patrol plane squadrons manifestly should be operated by the Navy. They operate altogether over the water and usually well out at sea. Therefore they must be seaplanes of the twin-pontoon or flying-boat type. Large long-range multiple-engined flying boats are essential for distant offshore patrol. Smaller medium-range, single-engined, twin-pontoon seaplanes may be used for closer inshore patrol, but flying boats are used in peace time. All development of both these types of aircraft has been made by the Navy. For patrol and attack their crews must be familiar with all types of naval and merchant vessels and know their capabilities and limitations. They must know naval tactics and be able to operate and communicate with surface craft and submarines. They must work continually with the naval radio-compass service. They must be prepared to operate with the fleet when it enters their area, or they reënforce it for a decisive battle. All overwater coastal patrol and all attack on vessels at a distance from the coast can be conducted most efficiently by naval planes.

In case an enemy air bombing attack is successfully launched from carriers against important objectives ashore, it must be countered by pursuit (or fighting) planes. Antiaircraft guns constitute a final method of defense. As both these weapons are used over or very close to the land in repulsing such attacks they have appropriately been assigned to the Army.

In case, as is highly improbable, the enemy attacks in strength and pushes in toward the coast for a bombardment, blocking or landing raid, as at Zeebrugge, the naval district forces—aircraft, submarines, destroyers, and mine layers—are reënforced by such elements of the fleet as are available and dispute the advance of the enemy. If they are unsuccessful in repulsing him, control of the defense passes to the Army. The fixed and mobile coast defense batteries come into action. These batteries have their specially attached planes for the observation of gunfire. Finally, if a landing is attempted, mobile troops of the field army or oversea garrison enter the action, supported and assisted by their attached aviation—pursuit, attack, bombardment, and observation. Possibly there may be additional bombardment aviation attached to the coast defenses, distinct from that attached to mobile troops and over-sea garrisons. If, as appears probable, there would be little use for such specially assigned bombardment aviation, it would serve a good purpose as a reserve for the mobile army. This Army aviation attacks the hostile ships close inshore, and enemy troops in small boats or on shore. It is neither designed nor trained for operations at a distance from land and is most effective when used in close coöperation with the other army elements.

The attacks on the coast thus pictured are necessarily those of a temporary nature. Such a raiding attack, while improbable, might be made in the temporary absence of our fleet. An attack in force with permanent occupation of our home territory in view would be attempted only after the total destruction of our fleet, including its planes and submarines. Even under these highly improbable conditions the chances of success would be very slight.

There is some possibility, however, of such an attack in force being launched against the Panama Canal. To meet this possibility the Army has provided a garrison of all arms—including all types of aircraft. The Navy has provided a strong submarine force. A considerable naval air force has been based there, primarily for the protection of shipping in the approaches to the canal and to detect the advance of hostile forces, particularly aircraft carriers. In the case of an attack in force upon the canal these naval patrol planes could and would be utilized for attacking the enemy with heavy bombs and torpedoes.

In general, similar peace-time precautions have been taken for the naval defense of Hawaii and the Philippines in case of a war in the Pacific. The naval vessels based in the Philippines are not considered district forces, but are called the Asiatic Fleet. Also, because of treaty restrictions, the naval air squadrons there are based on a ship, not ashore. Their war mission, however, is generally the same as that of the naval district forces at Hawaii and the Panama Canal.

We have pictured the normal air patrol of our coast lines and the water zone extending several hundred miles to seaward. We have stressed the execution of its primary mission of protecting shipping and the lines of communication of the fleet and have shown its usefulness in detecting and resisting attacks on the coast itself. There are other uses of our naval district aircraft which require emphasis. When our fleet bases on a part of our coast, enemy activity of every sort will be directed against it whenever it puts to sea. Before it does so, air patrol against submarines and mine layers must be constant. These duties should be performed by district aircraft—leaving fleet aircraft intact for operations against the hostile fleet.

If our fleet is making a sortie to offer battle with the enemy fleet off our coast, it is essential that every naval plane available should be on hand to help gain the decision. The importance of winning the decisive battle for the time supersedes that of coastal patrol. In a day's time every district plane could be assembled to take part in this battle. After the battle has been fought or our fleet has returned to port, the planes would again resume their patrol duties.

Assume that an enemy naval or air force should base at some point from which it could directly threaten our coastal routes or those leading to the Panama Canal. From such vantage points enemy attacks of a most dangerous nature could be launched. It would be imperative that the enemy be dislodged from such key positions. Our aircraft would be a most effective weapon. As they must fly to the attack across wide-water areas, seaplanes should be used. An attack force could quickly be assembled from our district patrol squadrons for this important purpose.

Again, the enemy's main fleet might shift its base southward for operations against the Panama Canal. Here there are ideal operating grounds for seaplanes. As soon as pressure upon our coast relaxed, a large proportion of our district patrol squadrons could be released for operations in connection with our fleet in the new theater of operations. Should our fleet shift its base to the Panama Canal, it would have the immediate support of a strong patrol air force. This would allow fleet aviation to be kept intact for battle. Also, in case of a naval battle off the canal the patrol planes could be armed with heavy bombs and torpedoes and reënforce the fleet. If our fleet contemplated remaining in port for some days, all or a part of the fleet aircraft could shift from carriers to the flying field of the naval air station for operation, training, or repair. In case a carrier were put out of action, or held in port for routine overhaul, its planes could operate in this way until repairs were effected.

Finally, in case the theater of operations should shift to a distant area, our district patrol squadrons would be assigned to tenders and accompany the fleet in its oversea movement.

Our patrol squadrons, while in home waters or at the Panama Canal or Hawaii, would act normally from shore bases. In the Philippines we are prohibited by treaty from building naval air stations ashore. Our air squadrons in that area are based on a tender. Insofar as the defense of the Philippine Islands is concerned, this places a serious restriction upon our naval air operations. Patrol squadrons can operate more effectively and economically from shore bases than from ships. It is a self-evident fact that the operating ground, not

the base, determines whether a force should be operated by the Army or Navy. While our patrol squadrons will normally base ashore, they will operate over the sea, usually at great distances from the land, and in the closest coöperation with all elements of the fleet and the naval district forces. That makes them a logical part of the naval establishment.

In peace time it is impracticable for financial reasons to maintain strong naval district forces within the continental limits of the United States. It would require a considerable time for large hostile forces to reach our shores. Merchant vessels, yachts, and naval craft out of commission could quickly be mobilized to form these naval district forces. In the same way naval aircraft not now in service and commercial planes could quickly be mobilized for coastal patrol. Until they are ready the United States Fleet will provide the necessary naval defense in home waters.

In the Panama Canal, Hawaii, and the Philippines conditions are different. In those advanced key points early enemy activity may be expected, possibly even before a declaration of war. District vessels and aircraft could not be furnished quickly from the home country and in some cases could not be sent at all. The fleet in some situations would not be able to provide direct naval defense. Therefore, the Navy has considered it essential to provide local forces during peace time for the protection of these outlying possessions and for the patrol and control of adjacent water areas.

We believe certain conclusions have been established in regard to the use of naval aircraft in coastal warfare:

(1) The patrol and control of water areas along our coasts and around our outlying possessions are distinctly naval functions of great and, under certain conditions, vital importance.

(2) Aircraft are the backbone of this overwater patrol and an important element in counterattacking enemy craft entering these coastal water areas. It is essential that these aircraft be operated by the Navy during both patrol and attack.

(3) These naval district aircraft are required for the screening of the fleet and its protection against harassing attacks when it is operating in or near their normal patrol areas.

(4) They constitute a naval air reserve which can be concentrated for intervention in a fleet action in coastal waters or to accompany the fleet in an over-sea movement.

(5) In emergency those naval aircraft based on outlying possessions may contribute effectively to the repulse of enemy attempts to capture these key points of our national defense or to a decisive victory in a fleet action fought in adjacent waters.

(6) Any restrictions concerning the basing of such aircraft or the weapons they may carry will greatly reduce their effectiveness—to the detriment of both national defense and economy.

(7) The provision of naval aircraft for Hawaii and the Panama Canal for patrol and attack, as contained in the Congressional five-year naval aviation program, is essential to an effective national defense.

(8) An acceptance of the foregoing conclusions leaves to the Army important air functions in coastal warfare. These are:

(a) The provision of observation planes to control the fire of fixed and mobile coast defense batteries.

(b) The assignment of pursuit planes to counterattack hostile aircraft over or near important objectives, as well as the use of antiaircraft guns for this purpose.

(c) The use of all kinds of military aviation, when attached to mobile troops and over-sea garrisons.

If the Army desires to supplement the naval patrol squadrons with bombardment squadrons not attached to mobile troops or over-sea garrisons for close inshore bombing of ships, boats, or troops on shore, there should be no objection, but this should not take the place of any naval aviation.

(9) The five-year programs assign eighteen hundred planes to the Army against one thousand to the Navy. This would seem to give the Army its full share of our air power. If any revision of this ratio is made, it should be in favor of the Navy.

NOTE: Since this article was written the aircraft and submarines at Panama and Hawaii have been attached to the United States Fleet. This facilitates the operations of shore based air squadrons in connection with the fleet and increases their mobility and flexibility, as emphasized above.

COMPUTED AZIMUTH BY THE "LINE OF POSITION BOOK"*

By Lieutenant Commander P. V. H. Weems, U. S. Navy

WHILE Rust's *Modified Azimuth Diagram* affords a speedy method of surprising accuracy for finding the azimuth, some people prefer to compute the azimuth. Mr. H. H. Brown of Red Bank, New Jersey, suggested to the writer the use of Ogura's Table B for the logarithmic computation of azimuth. The same formula that is used in the construction of the Rust's *Modified Azimuth Diagram* is used for computing the azimuth by Table B.

By this method those who dislike to use any sort of diagram have at hand an accurate logarithmic solution of the azimuth. Incidentally, the use of this formula for determining azimuth increases confidence in Rust's diagram.

By computing the azimuth by Table B as it stands, the unexcelled altitude tables of Ogura are left intact. Thus with twenty-seven pages of tables both the altitude and the azimuth are accurately determined by one standard method without tedious rules and for all conditions.

Directions

Enter Table B from the top with declination (d) and take out its log secant. Enter Table B from the bottom with the local hour angle (LHA) and take out its log cosecant. Add these two logs and get their sums. Next enter Table B from the top with the computed altitude (H_c) and take out its log secant. Subtract this from the sum just obtained and get the difference. Now with this difference enter Table B from the bottom and take out the azimuth. The azimuth is named like the quadrant in which the body is found, the same as with the diagram.

Example

Enter Table B at top with the declination (d) 10°-05′ and take out	676
Enter Table B at bottom with LHA (local hour angle) 49° and take out	12222
Sum	12898
Enter Table B at top with altitude (H_c) 23°-37′ and take out	3799
Difference	9099
Enter Table B at bottom with difference (9099) and take out the azimuth (54°-12′)	Z S54°-12′E

The Reason Why

Sin Z = sec H cos d sin t (see any book on navigation) in which Z is the azimuth, H_c is the computed altitude, d is the declination, and t is the local hour angle.

We can invert the above equation and write:

$$\text{Cosec } Z = \frac{\sec d \text{ cosec } t}{\sec H} \text{ and of course,}$$

$$\log \text{cosec } Z = \log \sec d + \log \text{cosec } t - \log \sec H$$

Ogura's Table B is simply a table of log secants when read from the top and of log cosecants when read from the bottom.

Sun Line. On the morning of 23 Feb. 1927, in D. R. Lat. 38-09-20 N, Long. 50-38-30 W, observed the sun bearing SE for a line of position as follows: W 8-37-45, C-W 3-40-45, chronometer slow 1ᵐ 50ˢ, H. 23-30-00, I.C. (+) 1′—00″, ht. of eye 65 feet.

* See Secretary's Notes, page 142.

AVIATION TRAINING FOR MIDSHIPMEN AND LINE OFFICERS

By Lieutenant Commander D. C. Ramsey, U. S. Navy

IN THE spring of 1929 there was organized and established a new unit in the aëronautic organization; VN Squadron 8, which was assigned to duty at the Naval Academy as a permanent and integral part of that institution.

The work accomplished by VN Squadron 8 during the summers of 1929 and 1930 has closely paralleled that undertaken by units of the Aircraft Squadrons, Scouting Fleet, during similar periods in 1925, 1926, 1927, and 1928 except that in 1926, 1927, and 1928 personnel under indoctrinal flight training were the newly graduated ensigns of those years and in 1925 approximately one-third of the members of the first class who did not participate in the summer cruise. Present policy provides for a flight course for members of the second class which remains at the Naval Academy throughout the summer and, in addition, flight training for the first class during the first two and last two months of the academic year.

Had the number of line-officer applications for flight training at Pensacola kept pace in the past with the rapid expansion and increasing personnel needs of the aëronautic arm of the service, it is believed that VN Squadron 8 might not be a part of the Naval Academy at the present time. This thought, in itself, expresses, perhaps, the principal reason for its existence.

On September 15, 1928, the then commander in chief of the U. S. Fleet, faced with an acute shortage of academy graduate naval aviators in the operating aviation units afloat, submitted the following views to the Navy Department:

> It is clear that the old systems, old methods will not fit the new conditions. We must devise new methods, formulate new principles to fit the new conditions. They may be radical but they must be sound, and they must solve not only the immediate problem but be such as not to bring a greater problem in their wake. The root principle that must hold throughout any system or plan that is adopted is that the Navy's aviation officers must be naval officers in every sense of the term. This can be done. It must be done. But it can be done only if the Navy supports its own institutions. The one sure way is to begin at the beginning. The beginning is the Naval Academy. If interest in aviation is implanted in the midshipmen there from their earliest days there can be only one result.
>
> At present but one squadron of planes is assigned to Annapolis and for a short period each year. The only active aircraft squadron operations at the Naval Academy occur at a time when the main body of midshipmen is absent. This cannot fail to lead to the impression that aviation is a separate and not a correlated part of the naval profession. The time has arrived when aviation must be rooted in its proper place in the curriculum of instruction established for our naval officers of the future.

At the time the above views were presented the aircraft carriers *Saratoga* and *Lexington* had taken their places in the fleet, each with an assigned complement of seventy planes. In many cases personnel complements of attached aircraft units were made up of a bare nucleus of qualified line-officer aviators who took their places in squadron formation with Naval Reserve pilots, lacking in the flight experience which the nature of their work required and further handicapped by superficial grounding in the fundamentals of naval education. It was recognized that, while certain elements of aviation ground instruction had been taken over by various Naval Academy departments, and a flight course for ensigns had been in effect for three years, this total effort had been ineffective in producing the flow of applications necessary to build up the complements of the fleet aircraft squadrons to the required strength of best qualified officer personnel.

This brief historical discourse and the quoted views of a commander in chief of the U. S. Fleet are set forth to show how closely the interests of the Naval Academy in matters pertaining to aviation instruction

and indoctrination are affiliated with the interests of the aëronautic organization, an affiliation which reached, perhaps, the peak of its intimacy when members of the class of 1930 were called upon in January of their final academic year to submit applications for flight training at the fleet air bases and Pensacola.

The results of this call for applications for flight training were interesting. Approximately 70 per cent, or 281 members of the class, volunteered, with the net result that 173 of these successfully passed the required physical examination. While appreciable attrition has occurred at the fleet air bases and will occur at Pensacola it can be seen that the Naval Academy, recently, has made a substantial contribution to the aviation branch which will assist materially in the consummation of the five-year program of expansion.

These results, in the opinion of the writer, naturally follow the policy which has brought flying into the Naval Academy curriculum and made it one of the established routine drills. By this means, aviation, as visualized by the midshipman body, is rapidly becoming shorn of such mystery and superficial glamour as it may possess, but interest remains and will always remain for youth so long as close contact with aircraft and aircraft operations is maintained. This policy, likewise, has permitted the aviation personnel engaged in training to become a permanent part of the institution they serve, an advantage denied aviation units attached to the Naval Academy in the past.

It will not escape attention that the time appointed for members of the class of 1930 to commit themselves in the matter of future aviation duty was a potent factor in bringing about such hearty response to the call for potential aviators. For obvious reasons the number of applications will fall off considerably with increasing time between graduation and eligibility for the course at Pensacola. It will follow in the future that a certain degree of control may be exercised which will make a partial reconciliation possible between naval aviation's flying-officer requirements and the number of available candidates.

The reaction of the midshipman body to the established course of flight training has made an interesting study. Prior to the conclusion of the summer course of 1930 a questionnaire was submitted to each member of the class of 1932 as a result of which the following data were obtained:

(a) Sixty-four per cent of the class of 457 members had never been in the air prior to the summer 1930. Of the 36 per cent who had flown, a great majority had less than one hour's previous flying time to their credit. In some cases individuals had as much as forty or fifty hours. As might be expected, those of the greatest flying experience were least impressed by the course.

(b) Ninety-seven per cent considered themselves temperamentally qualified for aviation duty. It is believed that a majority of the remaining 3 per cent, who did not consider themselves so qualified, were influenced in this matter by a knowledge of physical defects.

(c) Eighty-three per cent expressed a desire to become naval aviators.

(d) Eleven per cent definitely stated that they did not desire to become naval aviators.

(e) Six per cent were in a doubtful state of mind as to the above.

(f) Ninety-three per cent stated that interest had been stimulated in aviation through the establishment of a flight training course for midshipmen.

(g) Six per cent stated that the flight course had left them unaffected in their attitude towards aviation.

(h) One per cent (five midshipmen) stated that the flight course had given an unfavorable view of aviation.

(i) One midshipman expressed a desire for lighter-than-air training.

Based on the number of midshipmen of the class of 1930 disqualified for flight training by physical defects (34 per cent of applicants), it is estimated that at least 240 members of the class of 1932 and a similar number from 1931 will apply and be found physically qualified for the flight training course at Pensacola provided they are called upon to commit themselves in this matter before graduation. While these figures may point to a future excess of probable requirements, a large potential reserve of flying officers is a healthy condition which will relieve any anxiety felt about filling the squadron complements of the new 10,000-ton cruisers, the projected aircraft carrier, and the carrier cruiser types which may become a part of the fleet in the future.

Before proceeding further with a general

discussion of aviation training it may be well to outline the scope of this training at the Naval Academy with particular reference to the flight course in order that the reader may have an illuminated view of conditions existing there at present.

The following table shows the aviation ground subjects presented by various Naval Academy departments, the classes of midshipmen affected, and the approximate time involved.

Department	*Subject*	*Class*	*Hours*
Ordnance and Gunnery	Bombing device. (drill)	1	2
Ordnance and Gunnery	Theoretical bombing and aviation gunnery	1	4
Ordnance and Gunnery	Machine gunnery on range	2	18
Ordnance and Gunnery	Assembly, care, etc., machine guns	3	4
Engineering and Aëronautics	Aviation engine overhaul	1	5
Engineering and Aëronautics	Theoretical I. C. engines and aëro types	1	32
Engineering and Aëronautics	Structure and rigging (practical)	2	20
Engineering and Aëronautics	Theoretical aircraft construction	2	32
Engineering and Aëronautics	Test stand	2	20
Engineering and Aëronautics	Aviation engine overhaul	2	20
Seamanship and Flight Tactics	Aërology	1	8
Seamanship and Flight Tactics	Naval Aviation (Warlick)	2	9
Navigation	Aërial navigation	1	10
Navigation	Aërial navigation	2	4
Electrical Engineering and Physics	Theory of flight	3	5

At the present time two naval aviators are attached to the Department of Seamanship and Flight Tactics and one each to the Departments of Ordnance and Gunnery, and Engineering and Aëronautics. In addition to the ground and classroom instruction duties performed by these officers as assigned by the departments to which they are attached, they are called upon during both summer and academic year drill periods to act as pilots for the planes assigned to VN Squadron 8.

Three additional naval aviators are attached to the Naval Academy as the permanent officer complement of the squadron.

One flight surgeon, with additional Naval Academy duties, is in attendance upon the aviation unit during all flight drills.

The squadron's enlisted complement consists of six chief aviation pilots, twenty-eight additional aviation, and twenty-eight general service ratings. For administrative purposes VN Squadron 8 is attached to the U.S.S. *Reina Mercedes* and depends to a large extent upon the facilities of that command to carry on its work. For drill purposes and all matters pertaining to the routine handling of midshipman flight groups the squadron falls under the jurisdiction of the Department of Seamanship and Flight Tactics.

The permanent aircraft complement of the squadron consists of seven VP and two VJ planes. At present four types of VP planes are in operation. Before the opening of the summer course in 1931 it is expected that the Academy's complement of patrol planes will consist of units of a single type.

During the summer, when the entire forenoon periods are available for drill, two flight groups of approximately twenty midshipmen each are handled daily. The twelve weeks' course is so designed that each member of the class in training receives five hours' flying time divided up as follows:

1 hour—Indoctrination, passenger flight.
1 hour—Engineering.
1 hour—Drift indicator.
1 hour—Drift computer and navigation (piloting by chart).
1 hour—Camera gunnery.

In the total four months of the fall and spring courses for the first class it has been found possible to average somewhat less than three hours flying time per individual. This is due to the relatively short afternoon drill periods and to adverse weather which forces cancellation of flight on approximately 20 per cent of the available flying days. The duties assigned to the first class midshipmen in the air are, in effect, a review of those of second class summer. In view of the interval which elapses between a midshipman's first and final contact with the Academy aviation unit no extension or elaboration of the duties assigned second class summer could be found profitable.

Under normal conditions four midshipmen are embarked in each VP plane, although in the fall and spring, when flight groups vary in strength as many as six have been flown in one unit at some sacrifice of comfort and time available for individual instruction and attention.

Lest there be any speculation about the actual operation of planes in which midshipmen are embarked it should be made clear that both pilot seats in VP planes are occupied by qualified aviators; one naval aviator and one naval aviation pilot. Under no circumstances are midshipmen permitted to handle the controls.

Of all considerations which bear on flight training at the Naval Academy the element of safety is of paramount importance. No measure contributable to the safety of midshipmen in their work in and about planes can be neglected. Once confidence has been instilled it can be maintained and individuals schooled through the processes of evolution to regard aviation accidents in the field in the same light that automobile accidents are regarded. Midshipmen expect protection. They deserve, and it is believed, that they receive a full measure of it at the Naval Academy, for they are not protected under the law as flying personnel in the aëronautic organization are protected.

Although effort is being made to indoctrinate groups of midshipmen in the details of the special appliances and instruments they are called upon to operate in flight, the time available for such indoctrination is necessarily brief. This particular phase of training is merely a desirable but incidental part of a scheme which has had, in its original conception, a much broader purpose in view.

If it is generally accepted that everything possible is being done at the Naval Academy to promote interest in aviation and to thus stimulate the flow of required applications for naval aviator training, it should not be overlooked that the future strength and efficacy of the Navy's air arm must, in the final analysis, depend more on the support rendered from without, than upon the effort exerted from within, that branch.

An aviation unit based ashore may, under many circumstances, operate under war conditions as an independent and unsupported command; but the aviator of the fleet does not belong to any such organization. If he is launched from the deck of a carrier or from the catapult of a battleship, cruiser, or possibly destroyer, he must feel sure that his floating command has not only complete knowledge of his equipment and its limitations but also knowledge of his mission, and its means of execution.

This thought carries with it a corollary. It brings certain principles which guide us in our outlook upon naval aviation in our service into searching light. These principles are:

(1) That aviation should remain, in all respects, an integral part of the Navy.

(2) That the primary mission of naval aviation is to support, extend, and supplement the operations of the surface forces of the fleet.

(3) That it is the mission of the Naval Academy to turn out its graduates with a groundwork of educational fundamentals upon which experience afloat may build the finished naval officer.

A study of these principles, indicating clearly as they do, that all naval aviators primarily should be naval officers, leads further to the corollary that all naval officers should be aviators; obviously, not in the literal sense, but in the sense that service training and education should include, at some time, for all those not temperamentally, psychologically, or physically qualified for flying duties as pilots, a comprehensive presentation of aviation as a subject.

It is true that many of the elements which go to make up the subject of aviation are closely related to other branches of the profession. It is likewise true, however, that the sphere encompassing the interests of any one department can have no definite radius. There will always be a certain overlap of functions in any sound institution, educational or otherwise. It is the overlap which provides the place for the seam which binds the various pieces of fabric of our organization together. It is considered entirely consistent therefore, and compatible with our accepted principles, that the vital and essential structural engineering, ordnance, tactical, and navigational elements which are part and parcel of aviation should not be forever divorced from it to those who cannot learn to fly, or for whom there may be no immediate place in the aëronautic organization.

It is interesting to take note of the fact

that the world power, whose flying personnel were landing on carrier decks as early as 1917, clings tenaciously to a separate aviation service organization and maintains on a parity of importance with the naval and military cadet establishments, an air force cadet college at Cranwell. It is further interesting to note that the Royal Air Force provides, exclusive of naval aviation observers, who are furnished by the fleet air arm, approximately 30 per cent of the operating aviation personnel for the British Navy. So much for the effort of the Royal Air Force for the Navy. Now for the contribution of the Navy to the Royal Air Force.

The following significant paragraph is quoted from the London *Times* of December 27, 1929:

> A reminder is given in current fleet orders that every effort is to be made to ensure that *all* midshipmen undergo the junior officers' air course while holding that rank. The names of those who are unable to do so are to be specially reported to the Admiralty on discharge to shore courses in order that arrangments may be made for them to undergo the course after appointment as sublieutenant.

While no brief is held for the British organization it is desired to stress the point that, if we aspire to parity with England in all respects, it would appear desirable to introduce in our service certain educational principles connected with the subject of aviation that have been given extensive trial and that have not yet been discarded by one of the world's greatest naval powers.

We strive for parity, but parity after all cannot be measured in terms of ships and tonnage. It can be gauged best by the qualifications of the men who man our ships. Success or failure, victory or defeat, rests, in the final analysis, with the man behind the gun or the man behind the plane. The naval aircraft pilot, without a guiding and understanding force behind him, becomes just as impotent in the air as a shell launched by erring hands and faulty eyes.

There is undoubtedly no art, of practical application in war, that has brought about so much controversy and divergence of studied opinions, as the art of aviation. It is quite beyond the scope of this paper to attempt a reconciliation of these views nor could it be foreseen that any such attempt on the writer's part would be convincing or profitable. There is, however, one opinion, not infrequently heard, with which he would like to take issue; namely, the thought that, in principle, there are striking features of similarity between the submarine service and the aviation service. Aviation and its component parts occupy a unique place in the naval organization. The light or dive bomber substitutes for the secondary caliber battery. The heavy bombing plane carries a bomb load equivalent in weight to a 16-inch shell and thus takes the place of the major caliber rifle at ranges beyond the effective ranges of the main batteries of capital ships. The scouting plane extends the function of the cruiser; the torpedo plane, those of the destroyer. The observation plane elevates the ship's spotter from the fighting top to a position 10,000 feet above the target, and the fighter seeks control of the air in zones which fall beyond the range of antiaircraft batteries. These activities cover quite a scope. They involve the operations of many different types of craft having different characteristics, different weapons, and different missions. To be effective such activities not only require coördination with operations of all surface forces but the nicest coördination within the air effort as a whole. It is considered that aviation is not accurately gauged when its potentialities are summed up by comparing it with a specific type of surface or subsurface craft.

Under the present organization of the Navy we hold, and it is firmly believed will continue to hold, aviation as an inseparable part of the line. It is generally accepted by both the mature naval aviator and non-flying naval officer of today that aircraft, in whatever form, cannot displace existing agencies of offense or defense. The airplane is a special instrument or weapon of opportunity, devised for special service, which combines in its elements structural features of detailed interest to many branches of the profession, but insofar as aviation is concerned, these details, in themselves, have little or no significance until their mutual relationship is understood. The flying officer, through the special education which he may unconsciously inherit as an aviator of the fleet, looks upon aviation, as a service within a service, as but one means to an end. To other than aviation personnel, paradoxical as it may seem, the manner in which the elements of the subject are presented and displayed suggests that aviation

is an end in itself. It is realized that a generalizing discourse may become involved and difficult to follow, with resulting confusion in the reader's mind as to the real substance of the idea the writer is attempting to convey. It may be well, therefore, to deal with this particular point in specific detail. Let us take, for example, the fighting plane. It is appropriate that we should select this type for our discussion, for it is the one type we cannot do without. If there is any doubt about this it must be clear that if we cannot spot gunfire from the air we must deny this advantage to the enemy. A complete fighter, as it stands, has a power unit and engineering accessories of interest to the engineering branch. As interesting, however, as the modern air-cooled, water-cooled, or chemical-cooled aëro engine may be to engineers, planes cannot be built around these types. Ultimate requirements in the completed aircraft power unit of weight, frontal area, fuel consumption, reliability of operation in inverted and acrobatic flight, performance at service ceiling, and a vast array of other factors must be considered in relation to the useful load, strength factors, compactness, endurance, rate of climb, range of speed, and maneuverability of the plane itself. These matters are inseparably related to the problems of aviation.

Let us look into the structure of the plane proper. The materials of which it is composed must offer the maximum resistance to the weather, for it must be kept on deck, exposed to the elements for long periods. Its degree of ruggedness must be such as to withstand the shocks of arresting. Its over-all dimensions not only must be such as to meet the requirements of the type, but considerations pertaining to the simple structural features of span and length and height must be adaptable to the carrying capacity and appointments of the vessels from which it will operate.

Once a tentative plane and engine combination has been selected we are confronted with the problem of the ordnance load. For what possible overload should strength factors be calculated? Shall we design our fighter for normal bomb-carrying capacity of eighty pounds or should the bomb load be in excess of this figure? Should our ship carry an offensive armament of fixed guns only and be, thus, of the pure fighting type with everything sacrificed to performance? Shall we decide on a single-seat or two-seat type? What is the limit of speed that can be tolerated for dive bombing? How abruptly can this ship be pulled out of a dive after such an attack?—a matter in which personnel, as well as material, considerations enter.

Even more involved material and tactical problems pertain to the VO and VS types of planes, in which provision must be made for amphibious chassis. These types launched from the catapults of battleships or cruisers must eventually seek a landing platform on the carrier deck. So in a normal cycle of operations the pilots of these types may become, in turn, part of a gunnery department, part of a squadron organization in a scouting group or spotting circuit, and temporarily part of a carrier's air department.

We have barely touched on a few of the many complex problems which attend the development of a single type of plane, problems which demand practical solution before our final choice of a preferred type can be made. The fleet is the only suitable proving laboratory. So the officers of the fleet become the final arbiters in this matter, and the technical and design departments are guided by their decisions. From many points of view, therefore, the aviation branch is a service within a service, although our fundamental principles prohibit its being regarded as such by the line officers of our Navy.

It may be profitable to project ourselves into the position of the commander, battle line. For him the force and direction of the wind during the approach disposition and deployment have taken on new and vital aspects. These may be the elements of paramount importance in the coördination of the air and surface offensive. The endurance of his observation planes, the proximity of their carrier based protective fighters, the probable types and characteristics of aircraft employed by the enemy in the engagement are all factors which must be taken into account before the signal is made to catapult spotting planes. The VO's launched, the die is cast. To be too early is as dangerous as to be too late. A miscalculation in the time appointed for this operation may bring disaster in its wake.

An attempt has been made to show that

the various elements of naval aviation are such closely related subjects that independent study of these elements cannot result in a clarified and comprehensive picture of this branch of the service. It is clear that an aviation effort, which may involve the employment of six distinct types of planes capable of taking offensive or defensive rôles, must be coördinated within itself before it can become an effective part of the fleet.

The problems of defense against the many forms of aircraft attack remain matters of common interest to every line officer in the service. To frustrate such attacks two important agencies are available—the fighting plane and the antiaircraft battery. Shells fired from our ships must not be directed at friendly targets. So, apart from the need for improvement in the schemes of recognition, there should be definitely established zones where the antiaircraft battery rests and the fighter takes on the defense.

Responsibility for the solution of these and a multitude of related problems is not the heritage of flying officers, nor is it the heritage of non-flying officers. It rests with the line officers of our service in whom must be amalgamated the qualifications of both.

It would appear desirable therefore that some educational scheme be devised for our officers of the future in which the many elements which form an inseparable part of the subject of aviation should be grouped, arranged in relative order of importance, and bound, first, under a coördinating head whose next duty would be to tie himself and those in his charge to the other established branches of the naval profession.

It is believed that the improvement of planes and of aviation safety devices and appliances may result, ultimately, in the modification of aviation's physical requirements. It is felt, likewise, that such discrepancies as exist between the physical requirements for admission to the Naval Academy and those for admission in the aviation branch should be so adjusted in the future, as to make the fourth-class midshipman a potential aviator in the same sense that he is now a potential navigator or gunnery officer. In conjunction with this thought it would seem appropriate that the number of naval aviators on duty at the Naval Academy should bear the same ratio to the total number of line officers on duty there as exists between the total number of naval aviators and non-flying line officers in the service.

The advent of aircraft and the aircraft carrier has added to the complexity of naval operations. Increasing effort is demanded on the part of all naval officers to keep abreast of rapid developments and thus, if occasion demands, to be able to compete on better than equal terms with those who are devoting their lives to a specialized study of the subject of aviation and applying their talents in the navies of foreign powers.

Such thoughts as have been expressed in this paper which suggest the need for more intimate knowledge of aviation by non-flying officers cannot be dissociated from the belief that officers identified with the air arm have corresponding need for increased knowledge of the other branches of the service.

As a result of operations conducted over a period of eighteen months at the Naval Academy, contacts with three classes of midshipmen have been made by VN Squadron 8. Through these contacts considerable light has been cast upon the effect of the introduction of a flight course in the Naval Academy curriculum. That this course has been, and will continue to be effective in assisting the service to give the needed degree of personnel support to one of its important institutions, there can be no reasonable doubt. The problem of the supply of officers best qualified to man the Navy's aircraft appears well on the way towards satisfactory solution.

A step which bids fair to produce a surplus of naval flying officers suggests the attending possibilities of a rotation of duties which will permit the future aviator more thoroughly to round out his education in the line. One additional step which will assist the non-flyer more comprehensively to visualize aviation and its interlocked elements appears to be the final degree of support the Navy can give to the aviation branch of the profession.

Courtesy Lieutenant Commander D. C. Ramey, U. S. Navy

THE AVIATION RESCUE BOAT AT THE NAVAL ACADEMY

Courtesy Lieutenant Commander D. C. Ramsey, U. S. Navy

THE FREE GUN SHOWING CAMERA ATTACHMENTS

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THE FREE GUN SHOWING CAMERA ATTACHMENTS

Courtesy Lieutenant Commander D. C. Ramsey, U. S. Navy

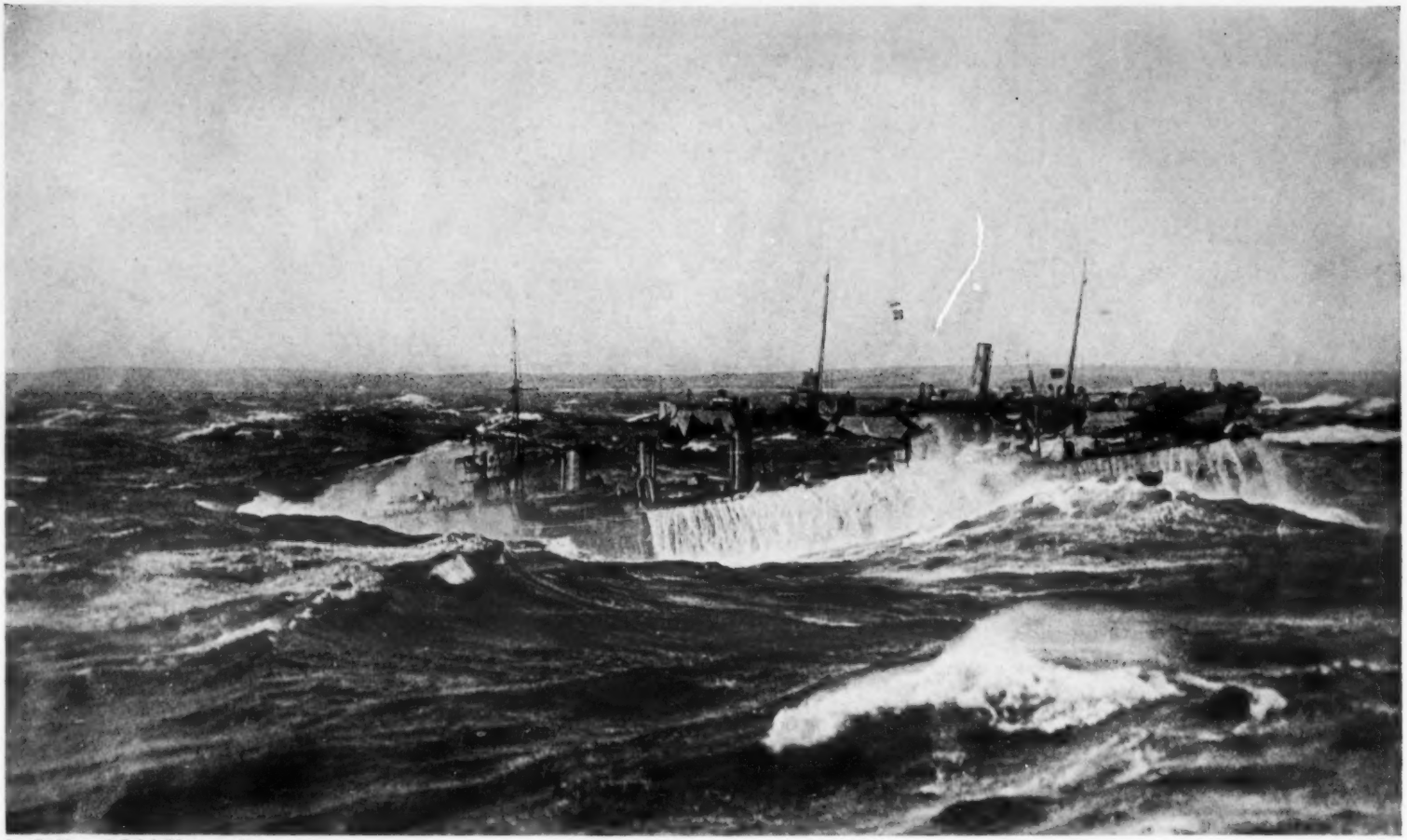
AIRCRAFT GUNNERY INDOCTRINATION FOR MIDSHIPMEN

Courtesy Lieutenant Commander D. C. Ramsey, U. S. Navy

MIDSHIPMEN EMBARKED IN A PM-1

Courtesy Lieutenant Commander D. C. Ramsey, U. S. Navy

MIDSHIPMEN EMBARKED IN A PM-1



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ON ESCORT DUTY

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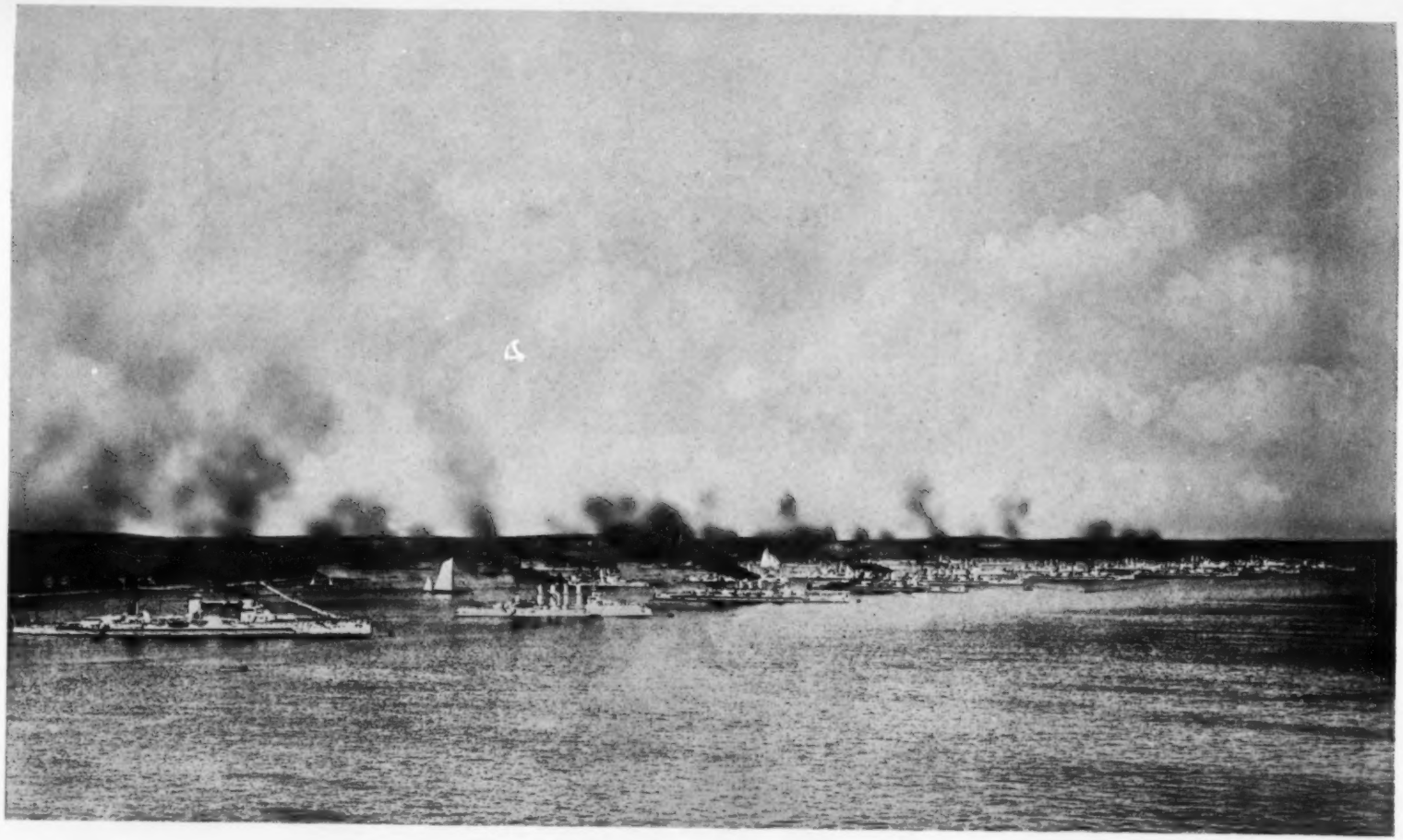
ON ESCORT DUTY



GERMAN GRAND FLEET, KIEL, 1914

GERMAN CRUISERS AT SEA, 1918

ON A LIGHT CRUISER DURING THE WAR

By Captain G. von Koblinski, German Navy (Retired)

DURING the past ten years, many books have been written on the war, strategy and tactics, losses and successes, but the psychological side has very seldom been discussed. It is not generally the habit of a soldier or a sailor to write and publish his feelings and thoughts. He does his duty and his feelings are suppressed, but he puts his heart into his work. Nevertheless, I am not ashamed to write down some impressions of my experiences during the few actions in which I participated because they may be of some interest for those who had no experience in modern sea fights. My experience as executive officer on an old light cruiser in a fight was different from that of the man behind the gun or the man on a bridge of a modern ship. Since real naval battles occurred very rarely during the World War, I shall extend my narrative to give a glimpse of events before war-time activity.

In May, 1914, I received my appointment as executive officer of a light cruiser of the *Bremen* class, launched in 1903, 3,250-tons displacement, 23-knots trial speed, complement 303 officers and men, with a battery of 10.5 cm. rapid-fire guns, and having an armored protective deck. She had been used for special service since her first commission, and was now used only as a target ship for torpedo practice and as a torpedo training ship. The crew had been reduced to one-half of the normal complement.

The ship was in preparation for battle inspection and my station at general quarters was below decks in the torpedo room, while at the same time I was relief for the captain. My battle duties were to organize the combat of leaks and other severe damages. The communication with the conning tower was a small armored tube through which only a slender man could climb. The personnel consisted of the surgeon, the paymaster, the navigation warrant officer, the entire crew for the two submerged torpedo tubes, and half of the stretcher bearers. This personnel almost completely filled the room, but in addition, we had to provide space for the personnel detailed to man the emergency rudder and the reserve engine-room telegraph. Crowded into this underwater compartment, separated from the ship's side by not even a longitudinal bulkhead, were twenty-eight persons. I looked with envy at my comrades on a modern cruiser of the *Madgeburg* class whose battle station gave ample room. In spite of the handicaps, we had excellent success at the inspection, due to the daily exercises in battle stations and leak-stopping service.

During Kiel week, we saw the most modern and most powerful type of light cruisers, the *Nottingham* class, and often reflected on what our behavior would be with our old, slow, under-gunned, and nearly unprotected ship against a ship of that size. When I mentioned this to a friend of mine, a gunnery lieutenant, he pointed out that the task of a small cruiser was to fight torpedo boats and not cruisers, and that our guns were the correct ones for the purpose intended. Our task was to operate at night when we had a better chance. By chance, the only fights that my ship had were at night, and this showed my friends's judgment to be correct.

At this time, there was much anxiousness and the general feeling that a thunderstorm was hanging over our heads. Our peace-time duties were by no means interrupted until we received orders to proceed to the Fehmarn Straits to patrol the bay of Kiel during the passage of the President of France who was returning from St. Petersburg. On the day following this event we continued our work in connection with target practice. In the midst of this peace-time work, the orders came for mobilization and we hurried to Kiel to clear the ship for action. Torpedoes which we had never proved were taken on board. The other half of the crew and officers was received from barracks, schools, and other commands, and

then with the greatest speed, we put ashore all superfluous and combustible material. To facilitate this work, we stole a lighter from a battleship during darkness because the demand for lighters far exceeded the supply. At 1:00 A.M., we entered the canal bound for our first station for the protection of the mines laid in the entrance of the bay of List at the island of Sylt. During the passage through the Kiel Canal, ammunition was prepared and the new men received short instructions in their stations at general quarters.

Early in the morning, having reached open sea, "clear ship for action" and "general quarters" were sounded for the first time in the life of our ship and in the lives of all of the personnel except myself. As a midshipman, I had taken part in a bombardment of some Venezuelan forts in 1902. I had had some further experience with the emergencies at sea, beginning with the shipwreck of a training ship while I was a cadet; then as a midshipman, there was an explosion of an ammunition chamber on board a cruiser; a fire on a steamer loaded with ammunition for four ships; and a collision between two small torpedo boats. As a midshipman, during a revolution and siege of a city in Santo Domingo, I had nearly been shot to death. I was not a stranger to emergencies.

We steamed through the German bight of the North Sea on a lookout for English cruisers and destroyers which we had no doubt would be encountered, but in vain. On our arrival at Lister Deep, we witnessed the laying of a mine field by the mine-layer *Albatross* which laid a field of some two hundred mines. The *Albatross* left the bay, making signal that one of the mines was armed and afloat. Damned mines! We searched for this mine and found it, keeping it under observation through our glasses. Early in the morning, a lieutenant was ordered to destroy it. His first attempt was to jump overboard with a line into the strong current in an effort to cut the connecting wires outside the mine, but due to its rapid revolving in the current he could not get hold of it. We then began to fire at it with a machine gun, and after some rounds, the mine exploded with a tremendous crash, and the cloud of smoke rising high into the air gave a disagreeable impression of its explosive power. We had to remain on station for about three days until some coast batteries had been completely installed. A terrible accident which could have been avoided brought the first dead to this theater of war. A collier that arrived from the Elbe without a pilot steamed directly into the middle of the mine field. Warned by all means of signaling, she finally dropped her anchor, but too late. On swinging in the tide, she touched a mine and was torn to pieces before our eyes. Only a few men who had been on the forecastle were rescued.

There were numerous rumors of the appearance of English scouts and destroyers, but when we left the bay to take up our new station near Heligoland as guard ship for the bight we met no one. Three weeks of patrol duty in the bight followed. We often considered while on the bridge during this period what we would do if suddenly attacked by fast cruisers. The general conclusion was, to give the alarm and then fight as hard as possible because we thought that we would not be felt alone for very long.

Then came the fatal day when Beatty made a rush into the bight. We were in Brunsbüttel coaling ship and arrived on the scene too late. When we reached the mouth of the Weser, we saw a small hospital ship steaming westward and supposed that she was on her way to search for the men from the missing *Mainz* and *Cologne*. This was not her mission and we learned afterwards that many of the complements of the two ships were drowned.

The effect of this day was an immense loss of confidence in the leadership of the fleet, but a gain of confidence in our training and weapons. The *Frauenlob*, a still older ship than ours, had successfully fought a new cruiser of the *Amphion* class and some modern destroyers. All of our drills and training had proved to be good and practical. The spirit of the crews was above all praise. All hands knew that we could rely on ourselves and our ships.

Although our ship took part together with others of her type in all sorties of the fleet as part of the screen, we never got into action. Once we were filled with envy as we saw the gunfire of the next ship ahead when she sank a destroyer.

New life suddenly came into our squadron when we were ordered to the Baltic to cover the capture of Libau. The Russians

had not undertaken any offensive measures in the Baltic except mine laying. And apparently they were trying to avoid meeting us. When the admiral was asked what to do with our old ships when the Russians did come out to interfere with the capture, we received the reply that they would not come out.

On arrival between the island of Gottland and Libau, the ships, each accompanied by one or two torpedo boats, steamed up and down in a thin patrol line. Two old armored cruisers and two or three light cruisers were stationed near Libau. On April 7, in a calm night and smooth sea I was relieved of the 8 to 12 watch by the captain. We had kept a good lookout for Russian destroyers which might emerge from the numerous exits among the islands. They would not risk much in meeting us as they were very fast and well armed with 4- and 4.2-inch rapid-fire guns. I went to sleep fully dressed but was suddenly awakened by the general alarm gongs. I hurried to my fighting station as the guns began firing although not firing rapidly enough to be directed against torpedo boats. The loud explosion of shells around our ship could be distinctly heard through the thin sheets of side plating. Soon these explosions became more numerous and seemed to be coming from larger caliber guns, and at last it was such a hail of explosions that it was impossible to distinguish one from another.

It was a very disagreeable situation: sitting perfectly idle below the water line, unprotected except by the thin side plating of steel, hearing the noise of the fight above and around me, the steering gear showing that the ship was changing course frequently, and having no means of learning anything about the enemy. All requests for information to the conning tower remained unanswered and indicated a very complicated situation. I knew my splendid captain well and was certain that if he had even a few seconds respite, he would give me all of the information possible by means of the telephones of the leak-stopping service in order that I might pass the news to the other personnel, who were working below the water line. The doctor, the paymaster, the navigating warrant officer, and I sat on the torpedo tubes and exchanged views about the presumed enemy. Later we learned that several ships with three funnels, but no destroyers, had been seen. Fortunately, I had my pipe and tobacco and by their aid could pass the time, idly waiting, because no call came for me, for the doctor, or for the stretcher bearers. Suddenly the wheel of the reserve helm whirled around and the order came: "Ready—torpedo tube—port." That was joyful news, not only to the torpedo crew but for all of us who were waiting idly for any event, be it good or bad. The torpedo held our attention. At last it was fired and we waited anxiously for the sound of its explosion against an enemy ship, but in vain. Soon after firing the torpedo, the explosion around us ceased and our own gunfire slackened and ceased. Then the order came for me to come up on the bridge. It was nearly daylight.

Coming on deck I felt like a man having been dug out of a trench after a bombardment. The fresh air, after the long stay in a semidark room filled with bad air from the breathing of so many people, was wonderful. I was agreeably surprised not to find many hits, dead, or wounded after such a fight as had seemed to me to be raging. The whole deck was wet from the splash of enemy fire which had surrounded our ship and there were innumerable shell splinters, but luckily, there was not a single hit. When I arrived on the bridge, I saw the Russian cruisers disappearing at full speed in the dim eastern horizon and the other German cruisers approaching. We were steering east in order to keep in touch with the enemy but were called back by the admiral. The captain was quite hoarse from shouting his commands. I relieved the captain on the bridge and we followed the squadron without making further efforts to encounter the Russians.

I learned that at half-past two in the morning the cruiser was standing eastward when some four white spots came into sight ahead and a little on the starboard bow. The captain supposed them to be the wakes of Russian destroyers and went full speed ahead, giving the general alarm. The four spots came rapidly nearer showing them to be four ships, and then the big funnels of the ships steaming on a course opposite to us were made out. As soon as the course of the enemy was made out, the captain turned to the opposite course and opened fire at a range of only 4,000 yards. The

Russian *Bajan, Makaroff, Oleg, Bogatyr* were each superior to us, but as all four of them fired with all their guns from their heavy 23 cm. to the light 4.7 cm., their spotting was inaccurate, and although the splashes completely surrounded us and we were in the center of a fountain, we were lucky enough not to be hit. This description is from our other ships. They said "poor ship," and came nearer but were still too far away to come in time. At any rate, the sighting of these other supporting ships caused the Russians to turn and retire after a fight of only forty minutes. It had seemed eternity to me.

I told the captain that the next time during battle I would prefer remaining on deck rather than sitting idly under the water line, but he assured me that the battle instructions were very strict on that point and that we would not always be so lucky as to have no work for me to do.

We were proud of that fight because, for the first time, a light cruiser had fought a superior enemy and remained afloat, forcing the enemy to retire.

The war went on, and whenever the fleet attacked the English coast, we accompanied it, but without anything eventful taking place. In port, new recruits, midshipmen, or reserve officers, gave the executive officer ample work, and the restrictions in food brought up difficult economic questions. Officers changed and captains as well. From 1914 to July, 1916, I had five captains, each different from the other. Hard work, too.

Battle of Skagerrak. Sudden raids had become so usual a matter that we had no thought of a fight when we weighed anchor on the evening of May 15, 1916, and took our usual position in the screen of the battle fleet. Only this time the course was northwest instead of west. It would be the usual thing: the battle cruisers and the modern light cruisers and destroyers would get in touch with the enemy or investigate some merchant vessels and we, with the battle fleet, would return to port without having even seen the English. Wonderful weather accompanied the progress of the fleet. I looked with pride on the endless line of battleships steaming beside us. Suddenly, a messenger from the wireless station dashed into the captain's cabin and the captain at once proceeded to the bridge. It was the first report of Hipper's sighting the English. Soon, too soon for me, followed the signal to general quarters and I had to disappear into the damn torpedo room. I had made up my mind not to remain in the room all of the time, but to have a peep now and then, and look ever the surroundings of my ship and the deck.

At first we passed the time in conversation between the surgeon, the paymaster, and myself, and a discussion of the news which we received from the bridge concerning the cruiser battle. As a squadron in battle, we had our position abreast Second Battle Squadron, the old *Deutchland* class, which means in the rear. After an hour had passed without any indication of our getting into action, I went on deck just in time to find us passing through a field of black, oily water, and I saw some German torpedo boats stopping in this, and with their lifeboats taking up survivors from the wrecks of English destroyers. It was an exaraordinary sight to see the boats going about their work of mercy in the middle of a battle. We had passed the scene of the cruiser battle.

Dead ahead I saw the line of battleships, the three battle squadrons and huge fountains of water of a size unknown to me. Light cruisers were heading to the north. After having seen this view, I could retire to my station and tell the others what I had seen, and inform the engine- and firerooms as well as all others below decks. What followed then was constant changing of course, slowing and increasing speed, but no fighting. However, I heard the well-known explosions of shells very near to our side, although I afterward heard that they actually exploded far away from us. The Second Battle Squadron and the Fourth Cruiser Squadron, both being at the rear of the fleet, could see absolutely nothing of the battle so that I missed little by staying below. Hours followed hours very slowly. As the paymaster had a pack of cards we played cards. By and by, we became sleepy as most people affected by bad air, darkness, and inactivity will; and most of the men went sound asleep. At nine o'clock I went on deck, ordered some supper for the crew, and went myself into the wardroom where supper had already been prepared. I knew from the wireless messages that I had read that we lost the *Wiesbaden* and two torpedo boats, but there was nothing about the English losses.

While standing on deck near the bridge, I suddenly saw two or four ships to starboard steaming on a course parallel to ours. I took them for German light cruisers as I had no better knowledge of the position of the enemy than anyone else, but from habit I took my glasses to get a better look at them. At first glance, I recognized them as English and reported them to the bridge. At the same moment they opened fire on us and two shells exploded near me, one in the after funnel and the other in the starboard cutter. It seemed more decent and worthy of a sailor to be standing opposite the enemy and looking him in the eye than to be hiding below. I felt also that I would like better to be one of the guns' crews who now opened fire and fought the enemy. Although one-quarter of the crew were recruits received on board only a week before, the deck personnel and gun crews behaved excellently and in accordance with their instructions. Replacing the dead, and removing obstacles were accomplished quickly and quietly, and I left the deck convinced that everything was going along all right. These two shells caused us four dead and a half-dozen wounded. The hit in the funnel was very inconvenient because the force of the explosion deranged the boiler casings on four of the boilers and caused our steam to fall. However, our excellent chief engineer and his stokers kept up steam anyhow. Because of poor visibility the fight ceased as suddenly as it had begun. It was twilight and the distance was 6,000 yards. Our enemy had been the Second Light Cruiser squadron of the *Southampton* class.

As the enemy was much superior to us and our gun layers could hardly make out the enemy ships, our admiral turned to the west. The disadvantage of the western position throughout the battle of Skagerrak made it very difficult for the German ships to use their guns. After having looked all over the stations on deck and below, I returned to the torpedo room. The men were in good spirits and glad to have had a chance to fight, and the stokers were proud of their ability to keep pace with the faster ships of our group. We had two hours' rest during which all were rather silent except for some who played cards, really the best thing to do. The temptation to sleep was great and I let the men do so. At twelve o'clock, the alarm was again sounded. According to the engine-room telegraph, the ship had again stopped. I learned later that the battle cruiser *Moltke* crossed the bow of our flagship and forced her to stop in turn. My ship had to give way to starboard and stop also in order to avoid a collision.

In this situation we sighted two enemy cruisers coming up from our port side at a very short range. All searchlights, as well as the guns, were directed on them, and with our ships nearly stopped, a short but terrible fight took place. For me it was at first somewhat the same as in the fight with the Russians, but only for some minutes. The first call for the stretcher bearers and the surgeon showed that there were some casualties. The gunfire indicated a sharp fight but the sounds of exploding shells under water were drowned this time by our own gunfire. This time there was plenty of life below decks. Reserves were called up, the port torpedo was fired, and then I received the call to come on deck because the captain had been wounded. I was already under way when the order came. All casualties and damages must have taken place above the armored deck as no reports came from the spaces below it. In fact the ship had received three 6-inch hits which came from 45° on the quarter, and struck the bridge. Two range-finder operators were killed, one officer fatally wounded, and several others on the bridge were wounded; but the casualties and damages had no effect on the ship's armament. A few minutes after the fight was over all was again in complete readiness to resume the fight. An inspection around the ship showed that the crew had accomplished everything to remove the signs of action. It required some time to locate the derangement of the steering gear, but in the meantime the ship was steered from the steering-engine room aft.

I stumbled over some dead when I came on deck but that was all I could see after the fight. The wounded having been laid out in one room were given enough morphine to keep them quiet.

Our enemy had been the same as before, the *Southampton* and *Dublin*, each armed with eight 6-inch guns and with an armor belt at the water-line. We could therefore not sink them with gunfire alone but the effect on the enemy was extraordinary. At a range of 2,000 yards every shot was a hit and our searchlights blinded the enemy so

that they could not return the fire effectively. As our rapid fire killed or wounded most of their gun's crews, they were able to fire only a few rounds. The torpedo which we fired missed, but the enemy torpedoed the brave old *Frauenlob,* our next astern and sunk her. Our submerged torpedo tube could not be pointed as readily as a deck tube.

Our total casualties were sixteen, nine of whom were killed. The night was a long and tiresome one for me because the captain had sustained only a slight wound on his hand and had again sent me down to my station. Nothing happened until early morning when I heard quite near to us the underwater explosion of shells, one salvo to port and one to starboard. The next salvo must hit us, but the ship turned away and soon the gunfire ceased. We had been fired on by mistake by a German battleship. The mistake had been made by the battery commander of a 7-inch battery at short range.

At four in the morning we were off Horn's Reef lightship. I provided a lunch of Frankfurters for the crew. This had to be heated in the wardroom and warrant officers' galley because they were heated by coal whereas the crew's galley was heated by steam, and all steam had been turned off from connections above the armored deck.

A submarine attack near Heligoland was the last event of these days. We then transferred our dead and wounded to a hospital ship and entered Wilhelmshaven. We now received the first information of the losses by the British, observed by our forces, and were very pleased and relieved because up to this time the only news that we had was of our own losses.

The torpedoing. On October 9, 1916, we again accompanied the fleet on a sortie against the English coast. Our position was six to seven miles abreast the fleet to starboard within signal distance. It was a wonderful day and the sea not bad. I had had the morning watch and after breakfast had just reclined on my transom for a short rest when I heard a tremendous explosion accompanied by the sound of cracking or torn steel as I was lifted from my transom and thrown to the deck. "A mine," I thought, as I ran into the torpedo room to determine by the reports from the different underwater compartments what damage had been done. Opening the voice tubes to some of the rooms, water poured out showing that the tubes were broken. The telephone also was out of commission. It was neccesary to determine the location of the damage by local inspection. The ship was listed slightly to port. The explosion was caused by a torpedo, fired from a submarine, which had hit us directly amidships, fortunately, for only one boiler-room amidships was filled.

Now was our chance to show what we had learned in our leak-stopping service. The carpenter and his mates were soon at work supporting the threatened bulkheads of the boiler-room forward and abaft of the filled one but the wooden framing thus installed seemed too weak for such a large surface. In the meantime, I discovered where water was entering other compartments, and successfully fought this danger.

The torpedo had struck between the armored deck and the keel making a hole of considerable size from the edge of the armored deck to the keel and a smaller one above the deck. The coal in the compartment between the armored deck, the vertical ship's side, and the main deck slid through this large hole into the sea. This helped materially in keeping the ship on an even keel, and by counterflooding, I succeeded in getting the ship nearly on an even keel. I was then able to pump out the small compartments. In the meantime, the ship lay stopped for about half an hour because the explosion had ruptured some of the fresh-water lines and salt water had been pumped into the four remaining sound boilers. I have never been able to understand the attitude of the English submarine captain. Instead of firing his last torpedo at us and thus insuring the certain loss of the ship, he saved it for the ship which would undoubtedly come to our rescue.

The torpedo boat accompanying us tried to take us in tow, but through lack of power she was unable to make any progress against the wind. When a sister-ship came to assist, the submarine fired a torpedo at her and missed. The submarine was now undoubtedly out of torpedoes because she fired no more as we lay there helpless targets during the operation of being taken in tow. Undisturbed by the enemy, we started on our homeward passage.

We were torpedoed at ten o'clock in the morning in the middle of the Dogger Bank. The fleet turned northeast and returned to Wilhelmshaven via Horn's Reef leaving us

alone. However, we received the protection of a flotilla of old torpedo boats and moved eastward at a speed of six knots. I tried my best by all manner of construction of frames to secure the one huge bulkhead which formed the only protection for the sound boiler-room astern of the one which was filled up, but as soon as I permitted even a slight increase in the speed of the ship the bulkhead began to bulge and water came in with tremendous power through the open rivet holes. Wooden pegs or plugs were driven into these. The carpenter and his mates, as well as the stokers, worked splendidly. Finally the engineer officer had repaired the fresh-water lines so that we could go ahead on our engines and not be quite helpless in the event of an attack when the towing vessel would be obliged to get clear of us. We expected an attack every minute because the submarine had certainly observed and reported by wireless to the Harwich flotilla that an easy success could be gained by attacking our helpless, slow, old ship and the escorting torpedo boats. Happily, they did not come so that early in the morning we reached the bay of Heligoland and dropped our anchor in the Jade River. We had to weigh anchor by hand because the steam lines to the forecastle were damaged. It was the first time that we had attempted this but the sailors enjoyed the novelty and ran around the capstan just as I had done as a cadet in the old training frigate. We went up the river and entered the harbor under our own power astonishing the ships in the fleet by our apparently undamaged appearance for we had practically no list.

In the dry dock when I inspected the hole in the side for the first time I was astonished that the ship should have behaved so well with such a hole in her side.

The men in the boiler-room which had been struck by the torpedo, one petty officer and two men, lay as though they had been stricken with heart failure in the exact position they had held when the torpedo exploded. Their lungs had been burst at the moment when the steam lines ruptured.

It was decided to send the ship to Kiel for decommissioning and to commission a new cruiser recently completed and ready for commission. For the passage through the bay of Heligoland and the rather long trip through the Kiel Canal, it seemed necessary to reënforce the supporting frames for the damaged bulkhead. The dockyard took this work in hand and used frames of double the size that I had used, but this was in vain. When we steamed down the Jade, and the captain tried to increase the speed to eight or nine knots, the frames bent like matches under the pressure transferred to them by the bulkhead which was receiving the full pressure as a result of the speed through the water. We therefore reduced speed to six knots and arrived safely but very late at the Kiel dockyard. The next day we hauled down the flag and commissioned a brand new cruiser on which I remained as executive officer under my fifth captain. I remained on this ship more than a year. After four years of continuous duty as second in command, I received orders to the admiralty, and was not a witness to the terrible breakdown of the wonderful fleet. It was some consolation to me that the crew of my former ship behaved just as honorably in the disaster as it had behaved under my observation in war time. I have experienced the grave responsibility of the second in command who is responsible for the training of the entire crew for battle, who is responsible for the efficiency, discipline, and spirit of the crew, and who, in the hour of battle and decision, must remain deep down in the ship, and gets a chance at active work only when something goes wrong. For every man on the ship has something to do during a fight, but the second in command remains below inactive.

The best rewards that I received were after three actions, when three different captains each handed me a medal and each said "The good work of the whole ship and crew is your work for you have trained them in all of it."

WHERE DO WE STAND?

By Lieutenant C. G. Moore, U. S. Navy

IN 1918 when the nation was at war the Navy's objective, in coöperation with the American Army and the allied forces, was to prosecute the war to a successful conclusion. Solidly behind the military forces stood the weight of public opinion marshaled by and voiced through the able committee on public information.[1] On November 11 of that year, the joint mission achieved, the country took a holiday. There was inaugurated a triumphal march up stately Fifth Avenue all abloom with the standards of the allied nations. Thereafter the Republic quickly lost its war consciousness, turned homeward to its peace-time activities and the pursuit of prosperity.

Eleven years later on the eve of armistice anniversary, Sunday, November 10, 1929, the churches of Fifth Avenue and their humbler prototypes conducted simultaneous thanksgiving services for a decade of peace and the fulfillment of the prophecy of Isaiah. War was rightly denounced as abhorrent. Long and loud were the invectives railed against Mars, his press agents and promoters. One nationally known minister, deploring the waste and suffering of conflict, voiced the fervent hope that he should never have to choose between being a patriot and a Christian; should he ever have to partake of that bitter cup he would turn his back upon the flag, his eyes upon the cross.

It would be gross effrontery to question the sentiments of this man. The purpose of his efforts like those of his colleagues was commendable. In the main their observations would be appropriate coming from a naval chaplain, or uttered from any pulpit on the continent of Europe. Neither would it be wise to challenge their somewhat extravagant demands to abolish along with war, all its hated instruments. It is their sovereign right as citizens—perhaps their solemn duty as moral leaders—to give full expression to their convictions upon so great a social problem.

That the churches conduct their affairs to the spiritual well-being of their adherents there is little doubt; that some of them at times have been inclined to preëmpt the prerogatives of the state has excited the suspicion and wrath of many political commentators. But it is when its zealous disciples as individuals indulge in the propagation of misinformation (often quite innocently) that the question of ethical responsibility arises.

One of the most frequent butts of "publicized" attack today is national defense. The vast organs of American public opinion—the *vox populi* whether of press, forum, pulpit, or radio origin—have in recent years centered much of their editorial comment and their oratory upon the Navy of the United States. No longer a mobilized unit under the strong arm of the famous committee, the shades of American public opinion are almost as numerous as the number of its agencies. Much has been said and written about the Navy that is correct, helpful, and clarifying. Many other agencies have made their organs the vehicles for censure and recrimination. Still other sources, for one reason or another, have been plainly guilty of misrepresentations and misstatements. It is to this last named group that the remarks which follow will be confined.

The life blood of the Republic is publicity. The *S-4* tragedy, the hard fought cruiser bill, and the London conference have each in turn fired the imagination of publicists and inspired the eloquence of statesmen and priests. It required 360 able journalists to cover adequately the London parley for American readers. Added to this purely reportorial group was a formidable list of editorial writers and radio broadcasters busily interpreting every detail of the negotiations. The people of the United States

[1] A war-time organization which by action of Congress was on June 30, 1919, dissolved.

for the first time since 1918 became acutely conscious of an American Navy. Its activities, its mission, and its needs were so thoroughly chronicled that only by canceling his subscription to the papers and shutting off his radio could the American citizen any longer remain ignorant of the fact that his Navy was a national issue of the first magnitude.

In such a welter of news and comment it was inevitable that much misrepresentation should have appeared. While many public spirited leaders and statesmen were stimulating an awakening national consciousness concerning American naval deficiencies, others were alert, for reasons peculiarly their own, to capitalize any expediency which, through attrition and neglect, might further emasculate the naval forces of the United States.

The American people are greatly addicted to slogans. Every presidential administration must have its watchword. With Roosevelt it was, "preparedness"; with Wilson, "peace"; with Harding, "normalcy," while during the Coolidge incumbency, "economy" was raised to the dignity of one of the most sacred words in the English language.

That Mr. Coolidge's program of "economy" never envisaged a sacrifice of adequate naval strength is evidenced by his oft quoted statement: "All the money that has ever been spent on the Navy has been returned to the community several times over in direct stimulus to industrial development."

Yet if we are to accept the attitude of contemporary writers, it is upon the shoulders of this formidable word, "economy," that future American hostility to naval preparedness will primarily rest. This topic has been so whipped and labored both at home and abroad that, during the height of the London negotiations, one celebrated English wit made the observation that the real object of disarmament conferences was not to make war less likely but to make it less expensive.

There has been much discussion about the American naval officers' rôle in public indoctrination. The question of whether officers as a group are qualified to perform this rôle has been given little consideration. In a recent issue of the Naval Institute PROCEEDINGS, a naval officer commenting upon the prospect of quality succeeding quantity in naval competition, referred to "the lifting of a huge burden from the backs of taxpayers." It is regrettable that naval officers are giving credence to the idea expressed in this phrase. It is lamentable when in their written and spoken word they unwittingly perpetuate a speculative theory so greatly at variance with ascertainable facts.

In 1918 the American Navy had but one objective—the enemy's defeat. Behind it, as in all wars, there was the unified support of the American public. Today it is but natural that there are many things seemingly more important to the American citizen than his Navy. While retaining a latent affection for the service, his mind is too engrossed in cares and obligations, more intimate and imperative, to spend his time verifying the sources of his naval information. The armed forces of the United States are the most conservative, the least editorially minded, branches of the national government. In a nation that spends billions annually upon advertising, the American Navy is, together with her sister-service, the only large non-advertising organization in the country. Whatever the Navy's rôle in public indoctrination, it is patent that the misleading utterances of an articulate but unsympathetic minority no longer should go unchallenged. For the correction of clear misstatements of facts it would seem that naval officers are best qualified. Unfortunately such is not always the case. While making no pretense at being a comprehensive list the following examples are cited as illustrative of how erroneous conceptions might have been instilled in the public mind and, in certain instances, antidotes are suggested. Confined to instances that are flagrant and palpable, they deal primarily with the specious economic myth and certain easily verifiable means for its dissipation. In the study of the cases that follow two elementary considerations should be kept clearly in mind.

First, by the American Constitution the "common defense" is the specific charge of the federal government. No state or local government contributes to its upkeep. In a republican form of government, where local authorities exercise most of the functions ordinarily coming under the charge of the supreme government in a centralized state, one of the prime duties of the national government is national defense.

Second, the average American citizen

pays little or no direct taxes to the federal government.

The farm journal.[2]—One of the most influential farm journals in the United States, whose circulation compares favorably with that of the largest general periodicals has for some time centered its editorial attack upon the dreadnaught. Characterizing the battleship as a costly anachronism this publication emphasizes the huge initial outlay of 40 million dollars; then calls attention to the fact that the $5,000 per day operating costs of one such ship would send 2,000 boys and girls to college each year, etc. Thus if we must have ships let them be of the smaller and less expensive variety. Aside from any stragetic considerations or naval needs it is a fact, too often overlooked by naval officers as well as civilians, that battleships despite their huge costs are ton for ton the cheapest warcraft in the world. With a given allowance of total tonnage by international agreement, if we wanted merely to economize on national defense and at the same time maintain the full-tonnage allotment, we would put the whole amount in capital ships. The question of diverting funds from battleship operating costs to the education of American boys and girls would involve certain constitutional readjustments that need not be considered.

Colleges and warships. During the London negotiations the president of a large Eastern college for women, in a Sunday radio address said:

> The richest university in America or the world, Harvard, has accumulated in a little less than three hundred years an endowment precisely equal to the cost of two battleships. The seven leading women's colleges of the east, after a life averaging about half a century, have gathered with infinite pains and thrift an aggregate endowment equal to one battleship. The largest of them teaches and boards two thousand young women on an annual budget less than it costs to maintain and operate one battleship.

It is not quite clear where the college president obtains his statistics, particularly since no battleship has been built by any of the powers in the past decade. However, the inference seems to be that should we be able to find a purchaser for our battleships at the outside price (presumably this purchaser would have to be a foreign nation) the profits could be diverted to American education. Yet even were such a procedure possible this would not so greatly enrich the educational budget as might be thought. Disregarding the endowments referred to by the radio speaker, investigation shows that the amount spent annually on education in the United States is considerably in excess of 3 billion dollars.[3] It may be observed in passing also that there is possibly some relation between the rich and heavily endowed universities that have flourished unmolested for so long and American naval defenses.

The billion dollar Navy. The following is quoted from a well-established Southern newspaper: "The enormous total of $1,200,000,000 *annually* is needed to carry on the American naval program at present." Substantially the same editorial appeared in certain Middle Western journals. One of the "canned" editorials phrased it this way: "The Navy is one of our most expensive institutions, and at present absorbs $1,200,000,000 of tax money annually. The life of a navy is about twenty years."

The annual naval appropriations for the past year were 374 millions. In very round numbers the amount varies in different years between 350 and 400 millions. Reduced to the lowest common denominator, it amounts to substantially less than one cent per person per day. It is interesting to note, however, that even were the yearly naval budget as large as was stated in these quotations it would by no means constitute a great and stringent "economic burden," that expression so dear to the hearts of all disarmament enthusiasts.

Road building and the Hog Island "navy yard." The following excerpt from an editorial appearing in two Middle Western papers is quoted as illustrative of how false impressions are propagated. "The sums we spend on the roads are small when compared to the enormous sums expended on the Navy. —— had time to look into the matter recently. He made a trip to Hog Island navy yard near Philadelphia. There he found new battleships rotting away because they were of last year's model." Describing this condition as typical of all navy yards he continues: "the monetary value of this

[2] Not merely an isolated periodical but illustrative of a type.

[3] 1928, $3,033,706,590 (Department of Interior, office of education).

war equipment, if expended in good roads, would build three highways of concrete twenty feet wide, north and south across the United States, and six highways of the same material east and west across the United States."

Since road construction is a particular editorial pet for comparison purposes with the cost of the Navy, it might be well to examine the figures of that industry. In 1928, the latest statistics available, the amount spent on road building was $1,423,870,278. The estimate for the year 1930 is 2.5 billions.[4]

So we see that if the government should scrap the entire Navy and discharge all its personnel without any retirement or other compensation, and then divert the naval budget to the peaceful pursuit of road building, it would add approximately one-seventh to the amount estimated for 1930.

The revelations of a statesman. Recently a prominent American legislator and one of the most effective spokesmen for naval economy returned from abroad. In an interview to the press he emphasized the "strong sentiment in both England and Japan against building up to the maximum limits set by the naval compact." This statement was widely quoted and made the basis for the largest editorial barrage since the London treaty was ratified. Writing under the caption "Setting the Naval Pace" one large American newspaper urged moderation and restraint by the United States, declaring that since we have the "initiative" we would have also the "responsibility" for any new naval race. Such arguments from a large and influential American journal sound strange indeed, when we recall that a few months ago Senator Reed on the floor of the Senate was constantly referring to the fact that the American delegates were "horrified" to find "the hopeless inferiority" of America in the categories limited for the first time at London. The Senator from Pennsylvania repeatedly alluded to the fact that while America built extensively, England would "reduce," Japan "stand stock still." With Japan practically built up to her full treaty allowance and Great Britain rapidly approaching this status, moderation in their case would not only seem a good policy but a mandatory treaty provision. The treaty gives Great Britain and Japan a holiday in warship building for six years, while during the same time it gives the United States a chance to get back into position. Should America not make the most of these opportunities, it is conceivable that the other powers might grow impatient, and be disinclined to grant this country an extension of the time limit.

Yet is it true that the other powers are moderating their programs? By the terms of the treaty Japan is precluded from any but a meager building program until 1936. Coincident with the returning congressman's disclosures about foreign moderation, Mr. Hector Bywater, famed English naval expert, in a dispatch to a large Eastern daily says in part: "There is a visible and waxing resolve (in Great Britain) to maintain at all costs a fleet of the largest dimensions permissible by treaty."

It may not be altogether out of place here to mention a concrete example of comparative "moderation" in its economic aspects. Japan between the Washington and London conferences expended for warcraft laid down and completed $7.00 per capita—her national wealth being $850 per capita. Corresponding expenditures on the part of the United States were $0.97 per capita—the national wealth being $2,666 per capita.

Sharp practice. Indicative of how sinister motives may be imputed to any naval endeavor, the following excerpt is quoted from a New England paper discussing a recent technical development:

> The Navy will observe the several clauses to the letter; but it will have no scruples in violating the spirit of the treaty. That spirit is disarmament as a means to permanent peace; and no unusual development in armament beyond that expected in the several classes of naval vessels can be construed as anything but sharp practice.

This quotation requires no comment. In fact very little can be done with editors who entertain a viewpoint so novel and unenterprising as this.

Now for a few additional statistics:

(1) The national wealth of the United States is 360 billions.[5] If we would insure this wealth at the lowest current rate for fire insurance ($1.50 per thousand)[6] the cost would be nearly 200 millions greater than

[4] Statement of the president of the American Automobile Association.

[5] National Industrial Conference Board.

[6] From a speech of Senator Hale.

the annual naval appropriation—an increase sufficiently large to build the treaty Navy in five years.

(2) The annual income of the United States (1928) was 89 billions.[7]

(3) The value of American over-sea trade is between 9 and 10 billions annually. *It has been foreign depredations upon this trade that have involved the United States in all of her external wars.*

While not strictly applicable, the following statistics are quoted as throwing additional light upon the subjects of portentous naval burdens, American taxation, and American thrift.

(1) The total government expenditures of the United States (state, local, and federal) for 1926 amounted to $99.23 per capita,[8] of which $2.67 was devoted to that service popularly designated as "our first line of defense." The Navy's share of the total tax budget then was something less than 3 per cent.

(2) Concerning the question of the mounting costs of naval security and its relation to taxation the statistics of an impartial agency show[9] that for the thirteen years, 1913-1926, while naval expenditures increased by 181 millions the total of our governmental expenditures (federal, state, and local) showed an increase of 8.7 billions, or nearly forty-eight times as much! In both instances of course these increases were due in part to the declining value of the dollar, the corresponding rise in the price of commodities, etc. But the main point is that these figures should scuttle the prevalent sophistry that to naval increases can be imputed the major ills of increased taxation.

(3) The national drink bill for illegitimate intoxicants is estimated at 2.5 billions annually.[10]

(4) The yearly revenue of the so-called "face-lifting" industry, purveyors of facials and cosmetics, is 2 billions, or twice the total amount America needs to build to the treaty limits.

(5) Revenue from tobacco products and manufactures is over 450 millions annually. The revenue from four well-known brands of cigarettes is in all probability more than enough to provide for the upkeep of the Navy.

(6) We spend annually a billion in movies, another billion at soda fountains, all the while shuddering at the colossal burden of naval armaments. Fifty-seven foreign countries today owe the United States and her citizens over 27 billions of dollars. Yet we pretend to be appalled at the prospect of spending a billion dollars in the next half dozen years for the American Navy. We are not yet a dozen years removed from a war, our participating for nineteen months in which has or will cost the United States 40 billions of dollars. From this war we emerged with no bill for reparations; no American flag flying over spheres of special interests or profit-bearing mandates. Yet we hear the alien rumble of an America that would dominate a poverty-stricken world by an economic imperialism, that by a titanic and aggressive naval fleet would ruthlessly dictate her sovereign will to the nations of the earth.

Enough of statistics. We have seen sufficient headlines disclosing the "greedy and insatiable maw of naval estimates." We will listen again and again to the dire prophecies of radio broadcasters. And following the well-known characteristics of headlines and ether waves these assertions will be subject to the same phenomena of distortion. Retreating for the moment from such rampant emotionalism and seizing a pencil and pad, one can easily estimate that this widely advertised billion-dollar naval building program would cost every man, woman, and babe in this republic one-fourth of a cent per day—very little less than the price of a postage stamp once every week for the next few years!

Yet, already we hear someone saying "It is not Americans that suffer from armament burdens. It is our fellow world citizens whom we must consider. The modern world is such an economic unit that no nation today can suffer grave depression without it having a deleterious effect upon other countries." Unquestionably a sound observation! The investigator should have further recourse to arithmetic. And if his calculations coincide with my own he will have a surprise in store for him. For a few cents per capita daily America can sup-

[7] National Bureau of Economic Research.

[8] Very recent statistics give the figure at over $100 per year.

[9] From statistics of the National Industrial Conference Board.

[10] From a survey of the Research Director of the Association against Prohibition Amendment.

port (if necessary to keep her own naval defenses inviolate) the combined navies of all her late allies, her late enemies, and her numerous conferees. And the only colossal burden she then bears is the stigma of reeking faintly of patriotism.

The purpose of this article is not to foster a spirit of impractical quixotism. There is much wholesome straight-forward opposition to the Navy from enemies, too honest to indulge in quackery or misrepresentation. Such opposition is salutary, often stimulating and helpful. For the Navy has nothing to hide. It is only the misstatements, the 100 per cent untruths, that poison the public mind and betray the public servants.

Earlier in this paper I suggested the question of ethical responsibility. Before me lies a circular letter from a large and growing organization. Calling attention to its past achievements it asks "for a crumb of your beneficence." As a further incentive to contribute to a cause so worthy it remarks with pardonable pride, "Friend and foe alike have borne witness to the important share we had in the defeat of the 'big-navy' program.[11] The campaign cost us approximately $11,000." Shades of the committee on public information! It might be a little humorous to some impartial observer to note how in the days of peace we are so deliberately endeavoring to neutralize the beneficial results achieved when the republic was in danger.

This article ends in two questions. Are naval officers, in adopting an attitude of splendid isolation, treating their fellow-patriots quite fairly in forcing them to accept the onus of correcting all false, malevolent, and subversive propaganda?

Are they coöperating to the utmost with reservists, patriotic societies, and public-spirited citizens in fostering that latent affection for the Navy which the nation clearly manifests whenever opportunity is afforded?

The memory of man is not so short that we of the present generation will witness the voluntary abolition of naval safeguards by any of the world's leading powers. Yet the 1930 schoolboy must be often puzzled to study in his history about the immortal exploits of Jones, Decatur, Farragut, and Dewey, and then see by the papers that the institution which nurtured these heroes has become an obsolescent toy, to be explained and apologized for by some of our more broad-visioned Americans.

[11] Apparently referring to the naval bill of 1928 which, following the *S-4* disaster, was substantially cut by Congress.

TENDERS TO MONARCHS

By Chief Boatswain John D. Thompson, U. S. Navy

THE battleship, cruiser, destroyer, and submarine, lordly monarchs of the seas, receive much attention. Their doings are chronicled from day to day in terms worthy of their exalted status as guardians of the nation. Of the little tug that contributes largely to their well-being in countless ways very little is ever heard, yet their call upon these little fellows is very considerable. A navy yard worth many millions of dollars would be so badly handicapped without a fleet of tugs as to be almost if not quite useless.

The Navy Department at Washington can tell you the name of every one of the big seagoing tugs that are operating, every one that is laid up for repairs, and exactly when they are to be available. When steam has been formed and the engines tested out after an overhaul of machinery, the department is informed by radio. The department considers it necessary to be able to dispatch an ocean-going tug to the scene of any marine disaster at once, besides the usual work in keeping tugs available for tending the fleet. The department requires that they be maintained in efficient operating condition at all times, and at intervals sends out a board of inspection to report on their condition. The inspection is as critical and the report as complete as that of a battleship. It covers everything.

The average civilian, a taxpayer who has intelligently exercised his franchise, has created a Navy, the most powerful fighting machine that the world has ever known, and about which in many respects he has very little knowledge. Of the tugs that handle this mighty fleet in and about the navy yards he knows even less.

In order to move any floating object from one place to another, with absolute certainty that it will handle properly and not become unmanageable, there are certain correct ways in which to secure the towing line or lines under all conditions of towing. A chapter in Knight's *Seamanship* is devoted to this subject in detail. In this article only the principal parts are mentioned.

Tugs tow from a tow line ahead, from the bow, and the quarter. At times, as in handling the large floating cranes in the yard, they are secured ahead of the tug and pushed along. When towing a large ship, the tug is laid alongside and secured with a bow and stern line hauled taut, to which is added a bow breast or spring line to hold her in position against the ship. This in general is used in towing barges of all sizes. Usually the two largest tugs are placed one on each quarter and the smaller ones well forward; sometimes, all on one side of a ship in order to hold it up against the wind and tide, or to breast it in to the dock. Various conditions at times cause the tugs to be placed in other positions.

A man on each tug watches the pilot on the bridge of the ship being moved, for signals. Nothing is done except upon orders from him.

In towing a very large vessel, at sea, a towline eighteen hundred feet in length is sometimes used. It is made up of two lengths of six-and-one-quarter-inch steel wire cables shackled together and capable of exerting a pull of over a quarter of a million pounds. In use the towline hangs in a bight, the center section being far below the surface of the water. It is not possible for the tug to lift the towline clear of the water. This prevents the possibility of a sudden jerk that would part the line.

The water-borne traffic about the yard is much greater than one might suppose, and the call for tug service at times exceeds the ability of the yard to furnish; this is especially true when the battle fleet is operating in the vicinity. At such times special arrangements are made in advance to have all tugs operating and in condition to meet the combined demands of the yard and fleet. When the fleet is present, the tug crews are prepared to make the best of it until the fleet leaves.

Battleships operate at sea, under experienced officers, where there is sea room, with apparent ease. They even transit the Panama Canal without the aid of tugs. They enter and leave without accident the harbors of the world, but when in confined waters without room to maneuver against wind and tide, the services of a tug are very desirable, in approaching Puget Sound yard for instance, and at times indispensable; so, when one of the battleships arrives off Restoration Point, above five miles from the yard, where navigation becomes difficult, the vessel is met by the yard pilot, a veteran in the art of handling ships with tugs, and, with a tug standing by, the ship is piloted to the yard. When the ship arrives off the yard all tugs are available to assist as necessary.

When a battleship arrives at the yard, no other work with tugs is undertaken until she is secured at her berth. A battleship coming in from sea has the use of her own engines in docking; this, however, is not the case after her arrival, as then her engines are disabled for repairs. After this, in moving from one berth to another, when entering or leaving the dry dock, the tugs must furnish the power. Handling large ships in such confined spaces requires considerable skill and experience both on the part of the pilot and tug master. The position that they have to take, the work they must do while there, and the exact time they must cast loose to get out of some place to avoid being crushed, require judgment and skill. All the tight places into which they are forced at times are not of their own making nor the fault of the pilot; the tug simply has to be in a certain place until just a certain time and then must be got out skillfully. A battleship moving slowly ahead would crush a tug like an eggshell should the tug get caught between her and the dock. Sometimes, though rarely, a tug gets her masts or rigging caught in some large ship's anchor, or on the boat davits that are rigged out, or on some projection from the ship; in such cases, the rigging or the masts snap like straws. In one particular case, one of the tugs was engaged in undocking a destroyer. The tug had to foul her rigging with the davits of a boat that was rigged out on a vessel lying at a pier, or go ahead on her own engines and force her way out, which she did. The result was a broken propeller blade on the destroyer when she came up on the caisson. The destroyer had to be docked again. Where one incident like this happens, many are avoided by skillful handling.

During stormy weather vessels are not moved except in emergencies. Sometimes when a move has been worked out and is in progress, especially in the winter months, a sudden squall comes up, and then if the tugs that are not in use are lying at the dock, it is an easy matter to get them out; if not, well, the pilot has to make the best of it. However, during the movement of a very large vessel the tugs not actually in use are held in readiness for an emergency like this.

On one occasion, while moving a battleship from the dry dock with the aid of three tugs, a sudden squall came up just as the vessel was approaching her berth. No lines were out to the pier. The squall was purely local, had given no warning, and struck for a short period with violent force. Slowly but surely the wind breasted the ship away from the pier, despite the tugs that tried to hold her up in the wind, over toward a new pier under construction. Only about three hundred feet away were broken piles from the old piers that had been partially removed, rafts of old and new piles moored together, workmen's barges, and hundreds of immense new concrete cylinders that were held in place by a network of taut wire cables. Into this the wind was slowly forcing a 32,000-ton battleship and three tugs. Every minute the sterns of the tugs were getting nearer the rows of piling that would rip off propellers as soon as they struck, after which the battleship could drift leisurely through, at what cost it would be hard to say. The tugs with their bow fenders against the vessel's side steamed ahead full speed, but the force of the wind was a little too great. From his office window the author saw this. He noted that white caps were forming on the water out in the bay. When the squall struck and the ship began to drift, the last tug was called out. It slipped out of its berth and around the end of the pier and the stern of the battleship, up along the rows of broken off piling and rafts, and, placing her bow fender against the vessel's side, opened her throttle and steamed full speed ahead. Slowly the vessel came to a stop, slowly it was breasted in toward the pier. Once within reach of

the dock, heavy lines quickly run out held her securely in place. Then, one by one the little tugs cast loose and returned to their berths, all ready for another call. Shortly after this the pilot came into the office and remarked, "I just about needed that tug." And so he did.

When a battleship is launched, gaily bedecked with bunting, bands playing, governors of states present, together with other officials, vast numbers of spectators ready to applaud this great ceremony, reporters to record it for the daily press, and thousands of cameras clicking, it is the little fleet of tugs that receive her in the water like a newborn babe; then during her active career she is tended and handled by tugs—and, finally—when her days of usefulness are at an end, and she is placed out of commission —it is the little fleet of tugs that take her away and just as carefully place her in "Deserted Row."

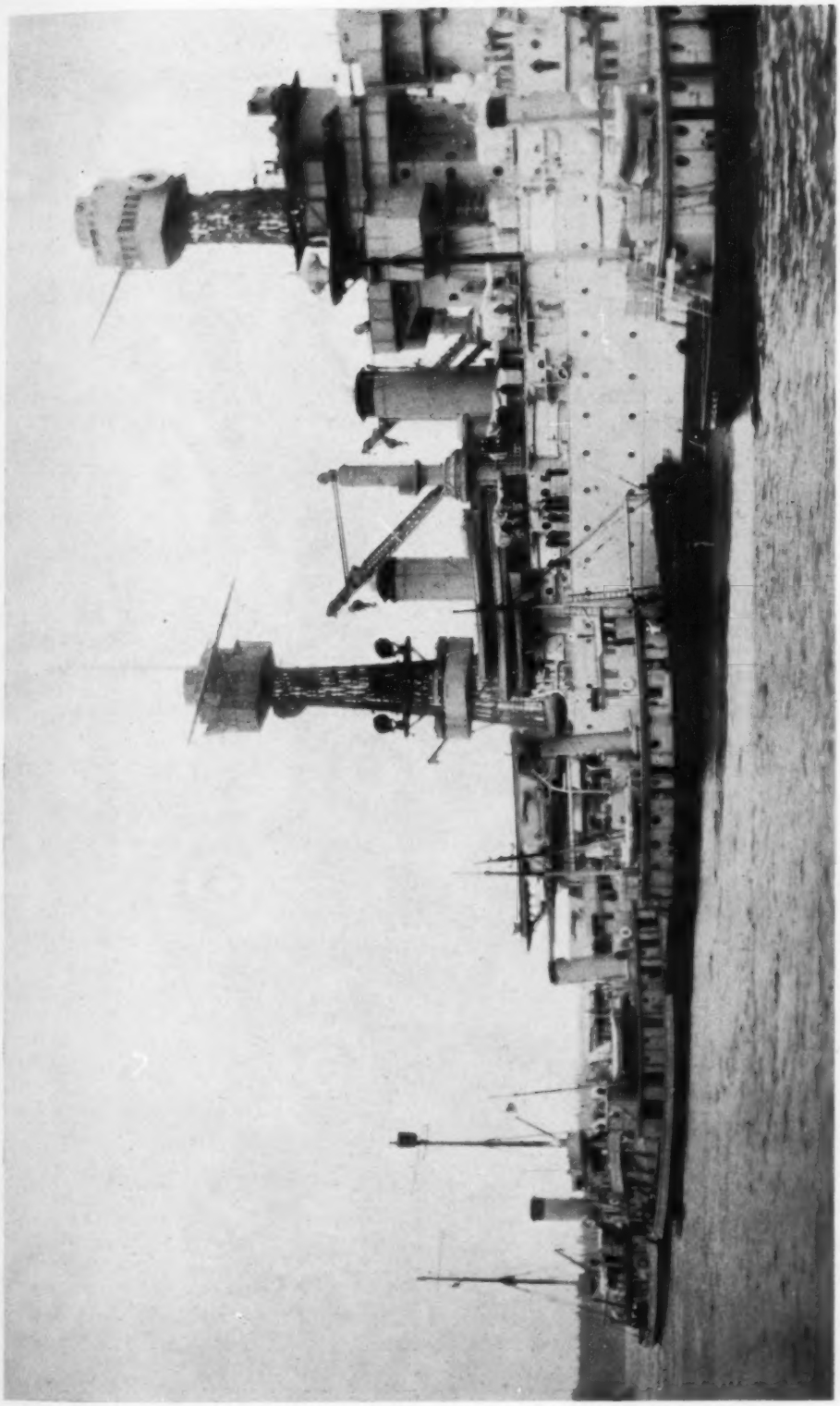
Let me remark that a trained tug-boat man is a very different person from a man with a tug. This is often very clearly illustrated, as men rarely stay on a tug longer than two years; they leave and return to the fleet every two years, so that there is a more or less constant turnover.

One of the first jobs of any importance that I undertook after taking over the tug service at the Puget Sound yard was the handling of practically the entire allowance of ammunition for a battleship. This ammunition had been assembled on four large barges at the ammunition depot, and was ready to be sent down on a certain date. While the tide currents at the navy yard have little effect, the channel to the ammunition depot is a very different matter. The channel winds in and out along its entire length of about four miles, and due to the fact that there is a large basin covering many square miles, the water pours through this channel with great force on each tide. It is customary, if possible, to so time the trips that the tug may go with the tide, but due to fog and other unforeseen things she was delayed on the return trip and caught the full force of the flood tide; needless to say she was delayed for hours, overloaded as she was it was barely possible to hold her position in the channel. During this time I had visions of ammunition barges scattered along the beach for miles. Meanwhile, the little tug with four barges, two on each side, steamed around the point, struck the tide rips, turned partly around, righted herself and steamed for the buoys. The tug master was standing on top of the pilot house and had stationed a man on top of each barge. If there was going to be a fire the chances of its lasting were going to be small. There was enough high explosive on these barges to have wrecked the countryside for miles around. This was the largest single shipment of explosive ever handled at the yard. Nothing of this kind has been attempted since. Some years ago there were several explosions at government arsenals; since that time not many chances have been taken.

Large shipments of ammunition are handled between all ships that visit the yard and the ammunition depot, torpedoes to the torpedo station, and shipments of explosives to merchant ships leaving Seattle for the Far East. It must be said to the credit of the tug masters that in the hundreds of shipments made there has not been one mistake made, even though in most cases deliveries to merchant vessels are made at night off Seattle Harbor, as the loading of explosives in the harbor is prohibited.

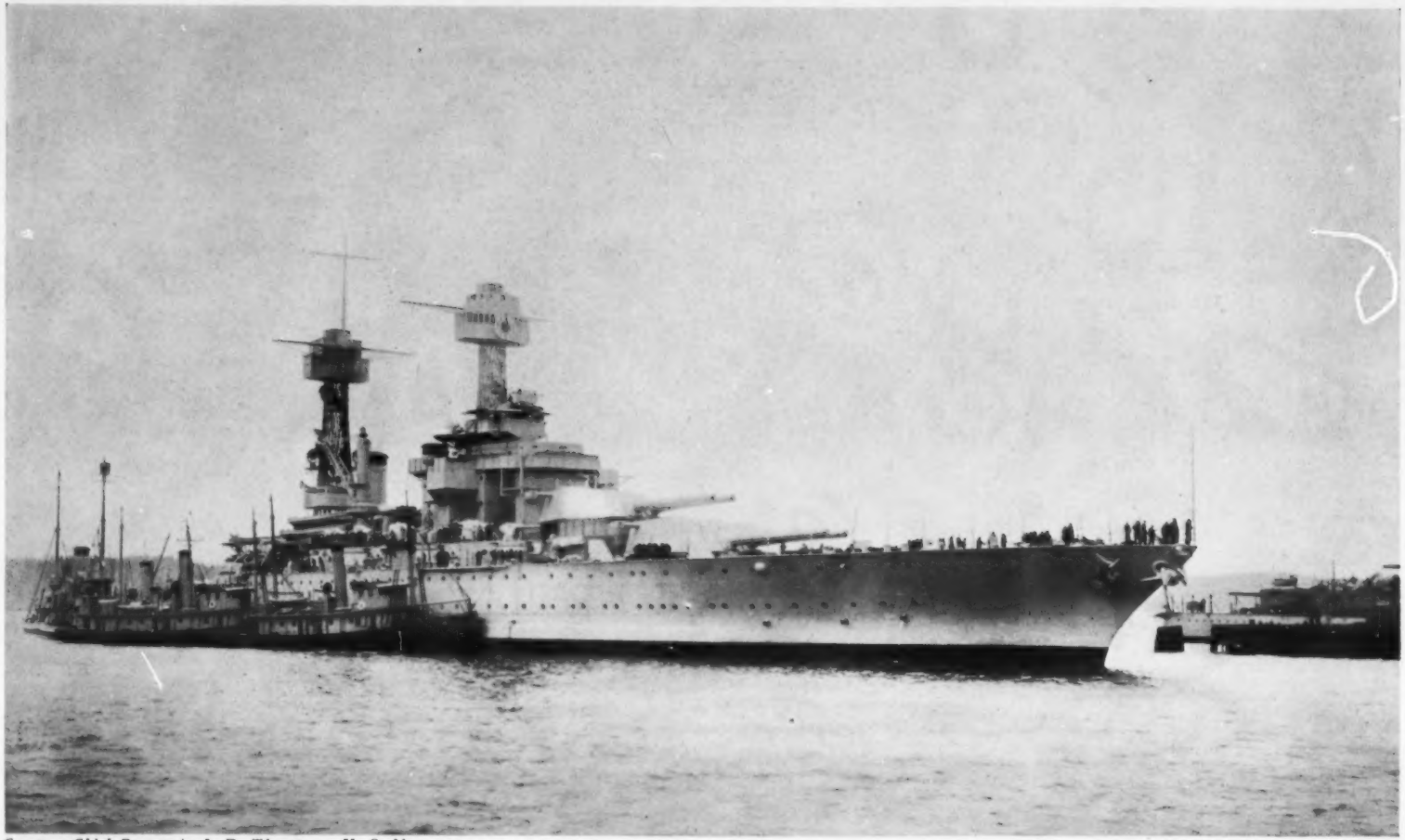
Sometimes a tug will leave the dock in the morning, probably only to move a barge, but will receive orders upon each return to the signal station to move something else until finally at the close of working hours she will receive orders to join the tug fleet in the movement of a battleship, and probably a midnight trip to one of the cities on the sound. Battleships are seldom moved during yard working hours due to the fact that anywhere from five hundred to one thousand navy yard workmen would be idle for approximately one hour, the time required to move her.

During the year the tugs are called on to handle almost anything from booms of logs located in places that are all but inaccessible, to a battleship. They are called upon to transport various things to points all over the District, witness diving operations where newly invented diving gear is being used, and a thousand and one things. The life of the tug-boat man is as varied as the climate in which he works, and anyone who knows of the climate here would say that that was enough.



Courtesy Chief Boatswain J. D. Thompson, U. S. Navy. Turner Photo

NAVY YARD TUGS BERTHING A BATTLESHIP



Courtesy Chief Boatswain J. D. Thompson, U. S. Navy

APPROACHING HER BERTH

The tugs are all ready to hold the vessel in place, against wind and tide, until she is secured with wire and Manila lines.

Courtesy Chief Boatswain J. D. Thompson, U. S. Navy

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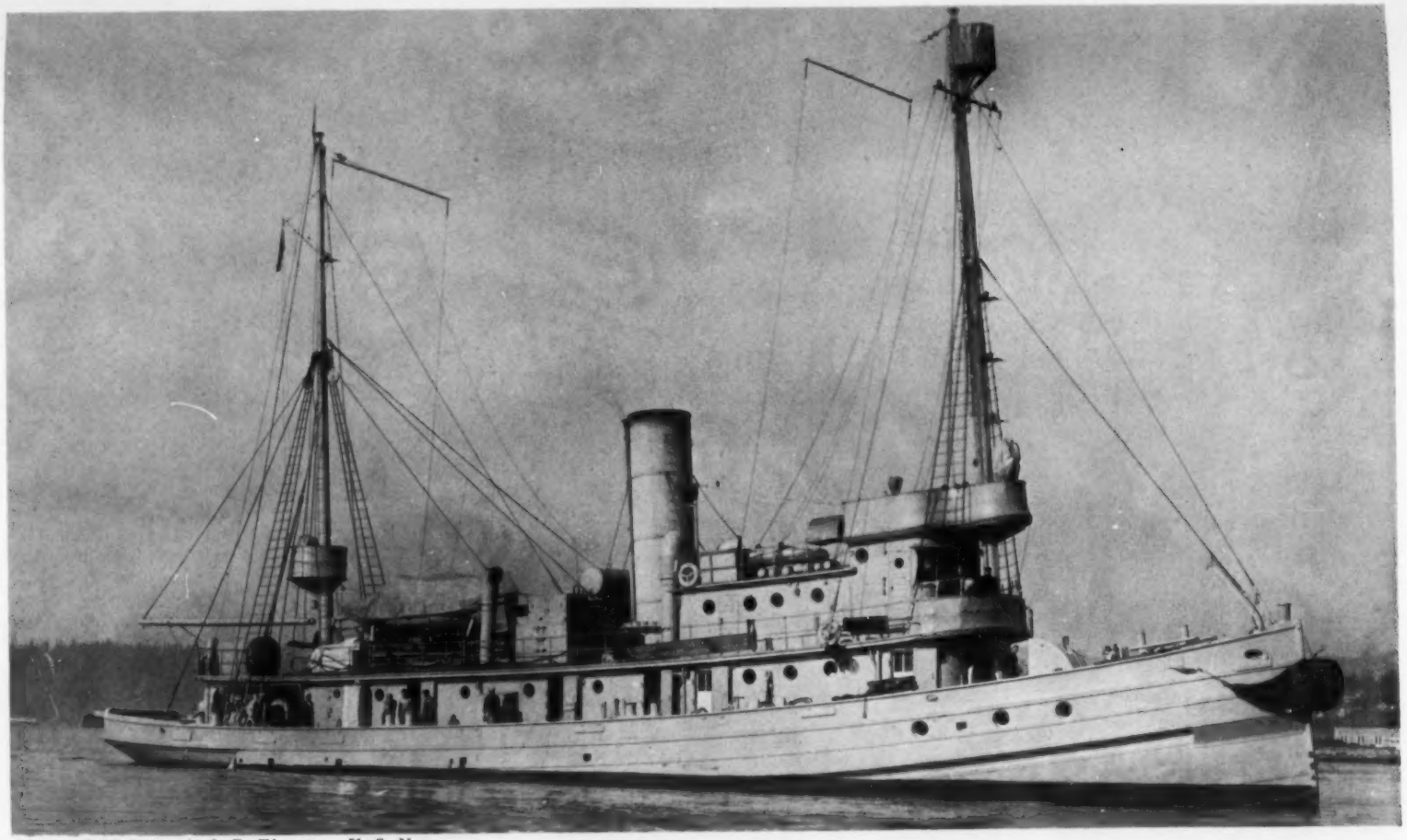
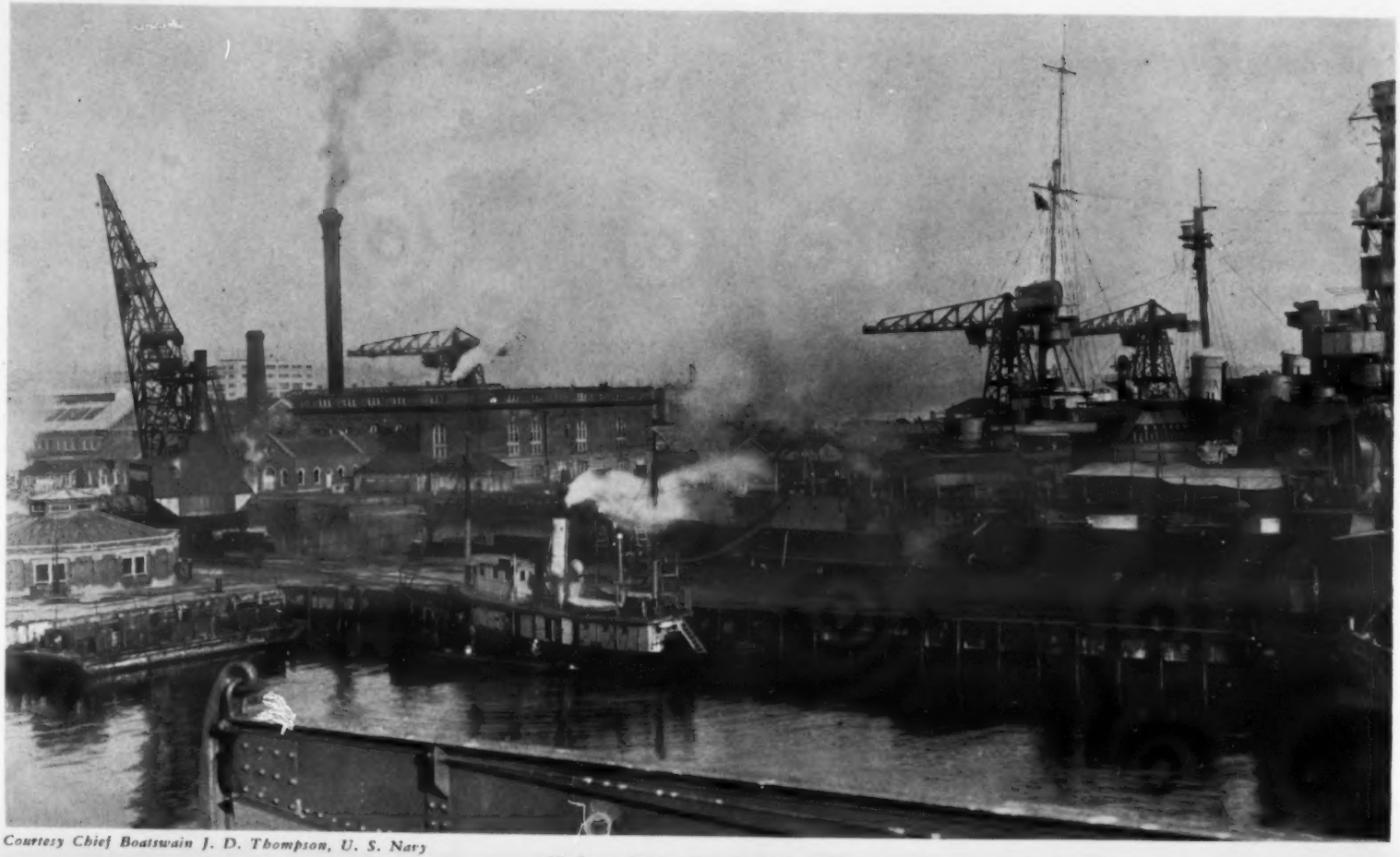


Courtesy Chief Boatswain J. D. Thompson, U. S. Navy

A POWERFUL SEAGOING TUG



Courtesy Chief Boatswain J. D. Thompson, U. S. Navy

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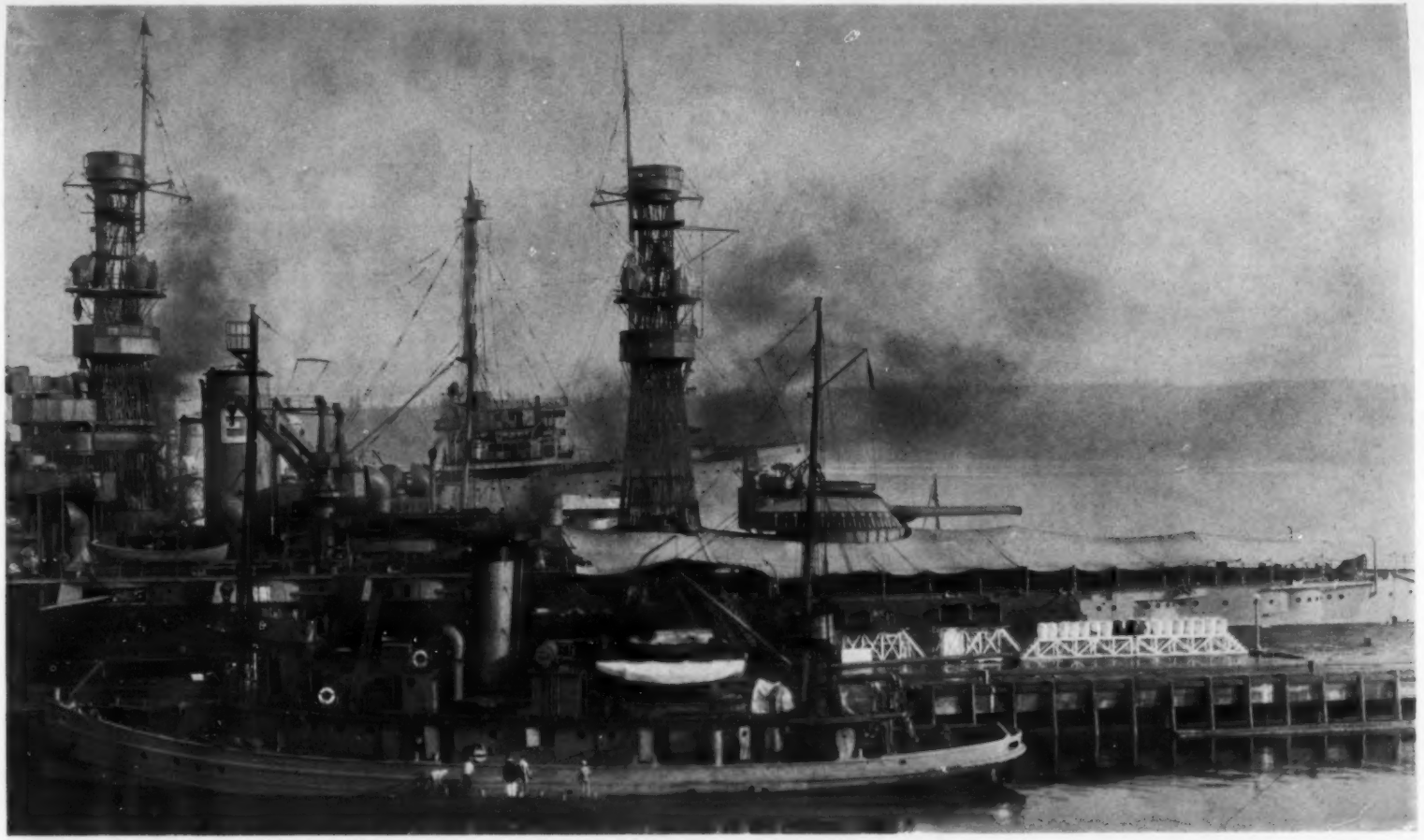
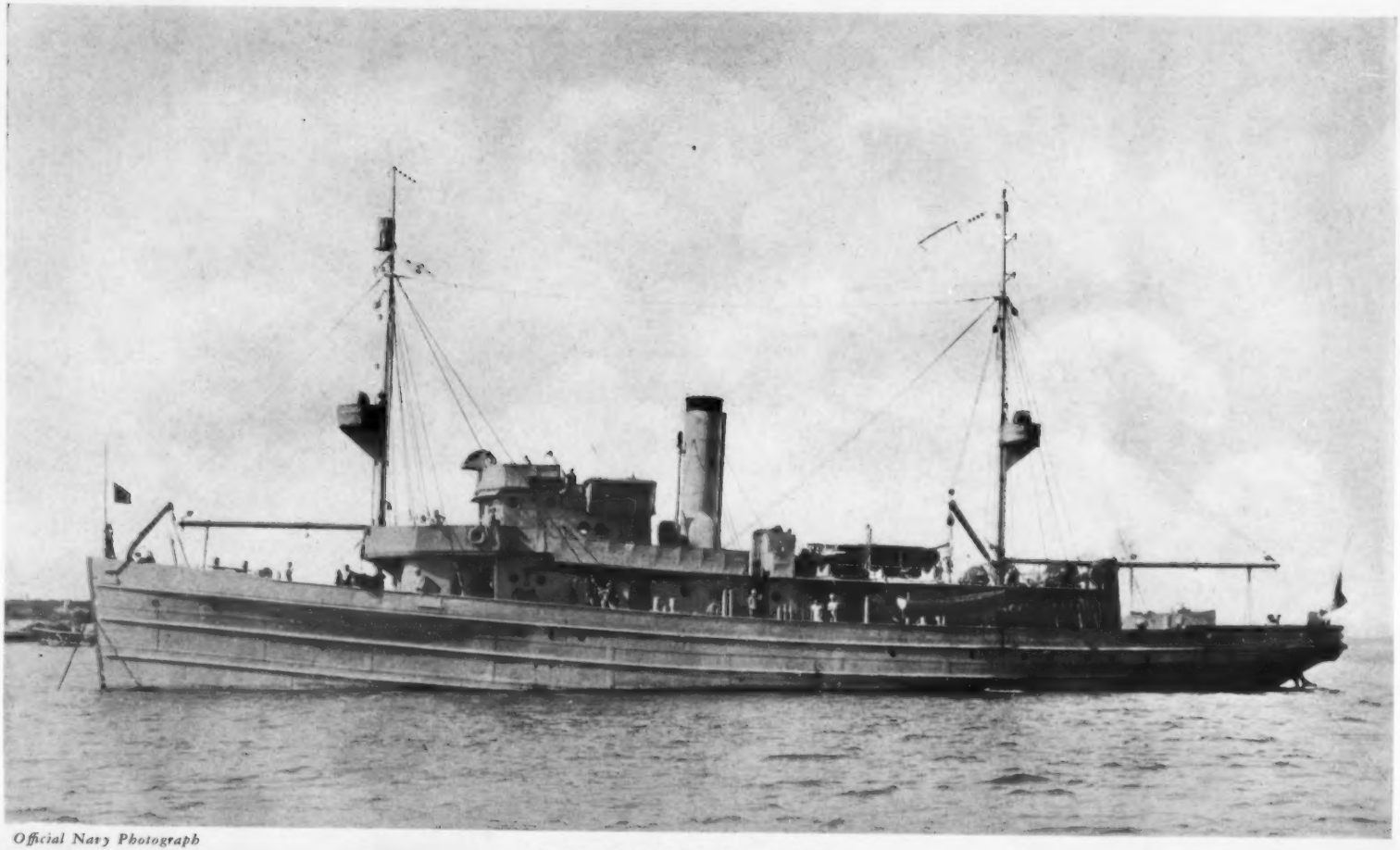


Courtesy Chief Boatswain J. D. Thompson, U. S. Navy

AMID SUCH SURROUNDINGS THE TUGS OPERATE

They render indispensable service to all vessels. (Right section)

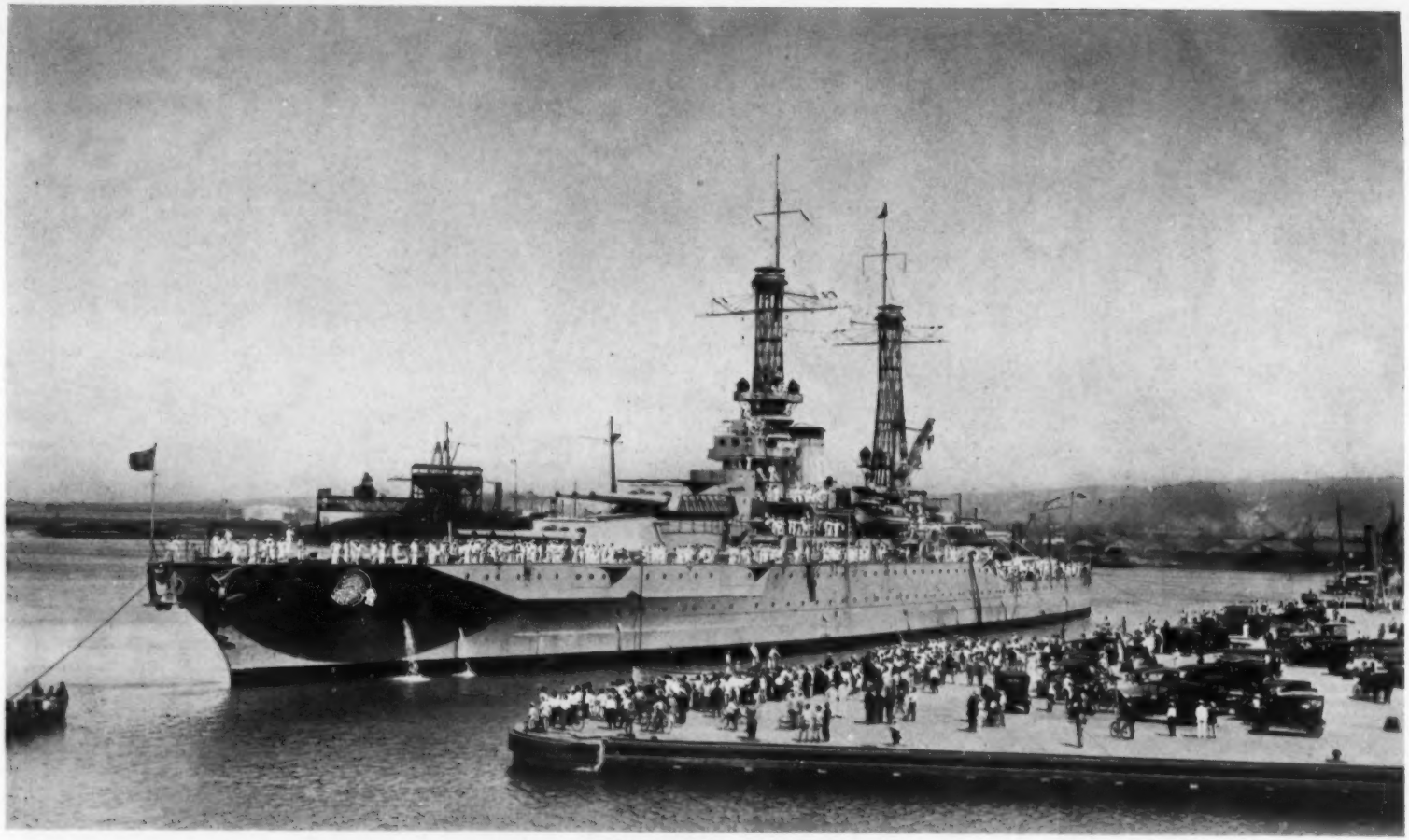


Official Navy Photograph

ONE OF THOSE THAT SERVES THE FLEET

Official Navy Photograph

ONE OF THOSE THAT SERVES THE FLEET



SERVING A MONARCH

Courtesy Raymond J. Walker

LAUNCHING OF THE U. S. COAST GUARD CUTTER *SHOSHONE*
The launching took place September 11, 1930, at Oakland, California.

SOME NOTES ON SHIP ADMINISTRATION

By Commander Claude B. Mayo, U. S. Navy

SOME time ago the writer completed a cruise of over thirty months as executive officer of a battleship. For the first year of this tour of duty the ship was in process of modernization in a navy yard under the most adverse weather and living conditions. The extensive alterations accomplished necessitated equally large changes in the interior organization of the ship's company. In many aspects the problems involved were greater than would be encountered in the placing in commission of a new ship of standard type.

Experience is the great teacher and this article is written with the thought in mind that a description of some of the *successful* innovations in ship administration and organization, tried over a comparatively long space of time, might prove of value to the executive officers both of small and of large ships. These experiments are simply the result of a study of personnel management as practiced in our great industries and of practices which have proven to be of real value in the service. Not all were successful and the ones not adapted to naval use were promptly and ruthlessly discarded. The thought that "the man's the thing" was kept ever present in mind.

Our mission was taken to be, "To so organize and administer the ship's company as to guarantee the highest efficiency in battle." That, of course, is axiomatic, yet in how many cases have practices, happy in themselves for the moment, but hardly able to stand the acid test of this mission, been allowed to creep in for seeming temporary advantage? It was clearly recognized from the first that the problems of peace must not have applied to their solution expedients which would weaken the moral qualities essential for victory in battle. Many times all of us feel that we might gloss over or pass by mistakes of omission or commission common to youth on the part of the personnel. And yet the very kindliness and mercy which would allow a greater leniency to the erring ones are really doing their characters an injury so grave and permanent as to preclude the attainment of the highest of the "battle virtues." Nor is such a practice fair to the men of good behavior. There is no thought of so-called Prussian hardness here but rather of the words of John Paul Jones, "He (the officer) should be the soul of tact, patience, justice, firmness, and charity. No meritorious act of a subordinate should escape his attention or be left to pass without its reward. . . . . Conversely he should not be blind to a single fault in any subordinate. . . . ."—and the *praise* is as important as the censure.

The general doctrine of the ship was laid down to be, "To accomplish our tasks with the least discomfort to the individual." Again this would appear to be a truism but have not all of us seen necessary jobs made quite unnecessarily disagreeable for officers and men? A "ship's company," and by this term is meant both officers and men, is quick to sense the care for the individual used by the higher command in the administration of the ship and being always singularly just and fair in their judgments, are equally quick to respond with alacrity to this thoughtfulness on the part of the captain or commander.

Discipline

The most important element in the morale of a ship's company is the administration of discipline. Food may be excellent, living quarters adequate and comfortable, the cruise itinerary pleasant and feasible, and training exercise not too strenuous, but the lack of a proper care for *justice* at the mast will ruin the whole. We cannot have *justice* without a *knowledge* of the culprit's character and previous record—a knowledge which cannot always be obtained from the man's service record. To enable the captain to act with necessary speed and accuracy the following procedure was observed:

(1) The executive officer was given a slip at "preliminary mast" as follows:

REPORT SLIP

Date .....

Name ..... *Rate* .....

Report:

Remarks:

Witnesses:

Reporting Officer:

.....
U.S.N.

The division officer as well as the reporting officer was present. The case was investigated and reference made to the man's "report card" as follows:

REPORT CARD

Name *Rate*

Date		Action
5/25/26	A.O.L. 20 min.	Ex.
7/29/26	A.O.L. 30 min.	2 hrs. ex. duty
7/20/26	Late quarters	Warned
9/15/26	Continually late quarters	10 hrs. ex. duty

If the charge was serious and substantiated, the necessary witnesses for the case were examined and the case put on the docket for the captain.

COURTS-MARTIAL

In a clear case involving a probable summary court-martial or a deck court the papers were prepared in advance. In case the captain did not award such punishment these papers were destroyed.

Ironclad rules were promulgated by the captain as follows:

(1) Every report must be administered within twenty-four hours of the report.

(2) Necessary specifications must be served on a man assigned a court-martial within six hours of such assignment.

(3) The completed record of the court-martial must be in the hands of the captain within forty-eight hours of the assignment of such court.

The number of courts-martial compared extremely favorably with other battleships but three separate courts each headed by a department head of experience were kept in constant readiness for the trial of cases. Cases were assigned in rotation.

All junior officers were required to pass an examination in naval law. One hundred questions and answers were assigned all junior officers for study and entry in their journals and quite a strict examination given each on these questions. The effect of this instruction was almost immediately noticeable in the handling of the courts. A "legal officer" passed on all courts before submission to the captain and embodied pertinent remarks in memorandum form in all cases.

In this connection the regulation requiring courts-martial to go to the immediate senior in command for approval sometimes involved necessary but long and irksome delays. This meant that the men were kept under guard for long periods and is considered worthy of consideration for modification. The writer has not the necessary knowledge to attempt recommendation.

REQUESTS

As in the administration of discipline at the report mast knowledge is the foundation of justice, so the granting or refusal of requests requires the utmost care and the utilization of every agency for information leading to final decision. There is almost inevitably a certain percentage of the crew who are constantly making requests. This practice comes not infrequently from the excessive egotism of certain men who wish to thrust themselves into the notice of the officers. To check abuses of "Request Mast," a card was prepared for each individual as follows:

REQUEST SLIP

Name ..... *Rate* .....

Date .....

Request:

Reason:

Approved or Not Approved

.....
Division Officer

REQUEST CARD

Name *Rate*

Date		*Action*
5/25/26	Special liberty	Granted
5/28/26	Special money requisition	Granted
6/15/26	Special liberty	Not granted
6/15/26	Special money requisition	Not granted

Appended to service records, these cards were used by the executive officer in the presence of the men, influencing his decision no little. Repeated requests for early lib-

erty, for extra liberty, and for special money requisitions were noticeably reduced when the man knew that a record of all his previous requests was available. On the other hand the executive officer inevitably seized this opportunity to speak in praise or in censure to the man for his quarterly marks shown in his service record.

The Home Service Department of the American Red Cross was constantly used to determine the correctness of a man's statement when emergency leave was requested in cases of death or illness. The prompt and efficient work of this great organization is invaluable to the executive officer. The very fact that the men *know* that this service is in constant use serves to preclude childish and untrue requests.

Special Liberty

The regulations require that 50 per cent of the crew be aboard when the ship is away from the dock at the navy yard and that 25 per cent must be aboard at all times in the navy yard. Observation over a long period of time established the fact that an excess over these quotas was invariably on board. A "Special Commendation List" was prepared of men whom the captain had commended for some deed or work of special excellence and these men were given a practically free gangway outside of working hours. A similar privilege was granted chief petty officers and petty officers first class who had *passed their examinations* for chief petty officer.

Frequently in the leave and recreation period in the navy yard it was found possible to grant liberty at 1300 instead of 1600. Divisions having no absentees were singled out to be given this privilege; those having absentees had to content themselves with the regular liberty. In all such cases the ship was carefully inspected by the head of the department having the day's duty and every division whose part of the ship was not up to the standard of cleanliness was promptly denied these extra privileges. The effect of these regulations was most salutary and often amusing incidents developed where incipient "overtimers" were brought back by their division mates.

Extensions to leave in response to telegraphic request were treated with every consideration possible and promptly answered.

It should be mentioned that promptness is essential at request mast as well as at report mast. In case the executive officer was away, even temporarily, the cases were handled at the regular time by the next ranking officer.

Special Details

The subject of special details from the gun and engineer divisions is of importance and unless orders are enforced it will be found that men will be kept for months and months on details which will take them away from their divisions and the consequent instruction in their general duties. This is particularly true in the case of messmen and of men detailed to boats.

Special details should be divided into two general classes: (a) permanent strikers for rates—gunnery and supply departments, etc.; (b) temporary details as messmen, compartment cleaners, galley, scullery, etc. A general rule was laid down that in all cases practicable in a permanent detail such assignment did not go into effect: (1) until the man had been one year in a division with attendant instruction in discipline, the rudiments of ship life, and at a battle station; (2) until he was transferred out of his division to the V or S or C divisions, the department utilizing his services. This was considered only fair to the divisions who lost the services of the man.

In the case of temporary details a strict check was kept on the length of time of such assignment and not more than ninety days (a quarter) were allowed such details. In order to assist the disturbing officer the details were changed on the first of each quarter. Have we not known of cases where men were kept as messmen for several quarters in succession?

Rating

The following rules were followed in choosing men for advancement in ratings:

(1) The requirements for service, etc., as issued by the Bureau of Navigation, together with the pay of all ratings, were kept posted on the bulletin boards.

(2) No man was advanced in rating who had not completed the Bureau of Navigation educational course for his next higher rate.

(3) Every vacancy was promptly filled if eligible men were on board.

(4) In case of several candidates for a rate the following points were considered: (a) total length of service; (b) length of

service in rate; (c) length of time man had been on waiting list, i.e., had passed all necessary tests; (d) quarterly marks; (e) marks on examination. In general (c) and (d) were assigned heaviest weight.

From time to time the divisions' records in qualifying men for advancement in rating were scrutinized and pertinent memoranda prepared by the executive.

In general the policy of transferring a man from a division when rated was laid down but was honored greatly in the breach. Such a plan is, however, deemed to be fundamentally correct.

Cases involving the breaking of a petty officer are important. Such men should be transferred to another ship in exchange so as to give them a better chance to "stage a comeback."

VOLUNTARY EDUCATION AND THEORETICAL INSTRUCTION

The old saying that "knowledge is power" applies with particular aptness to the men aboard ship. Nothing serves to heighten the morale of a crew so much as the self-respect, mental alertness, and real efficiency gained through proper theoretical instruction and a constant backing of a voluntary education system. A man is much less subject to the germs of evil living if his mind and body are kept healthily occupied. There was a very evident advancement in self-respect and pride of profession noticeable amongst the men who applied themselves to the study of the theory of their several lines of work. The following organization was kept active along this line of effort:

Education officer .....executive officer
Assistant education officer .....chaplain

Academic board .. { gunnery officer, navigator, medical officer, supply officer, communication officer, engineer officer, first lieutenant

Examining boards:

Seamanship and gunnery	(8)
Engineering	(5)
Yeoman	(1)
Medical	(1)
Supply and disbursing	(1)
Communication	(1)
Deck artificer	(1) etc.

The academic board met once each quarter to review the work accomplished and to suggest improvement in method.

Each board was composed of three officers and had a rated yeoman assigned.

A certain number of men were assigned each board for instruction and *weekly* marking. The average number of men taking educational courses was about four hundred and effort was made to assign not more than twenty-four men to each board or about eight per officer. A card was kept in the library and chaplain's office for each man. The senior member of each board was responsible that every card was marked once each week and in the hands of the assistant educational officer by 1600 on each Friday. Upon the completion of a course and the certification that he was ready for examination for advancement in rating, the man was assigned *another* board (when possible) for final examination and marking. The Bureau of Navigation issues certificates in blank for the completion of such courses and these were signed by the captain and executive officer and presented with some ceremony to the men. They value these certificates highly.

ATHLETICS

There are few greater essentials to a happy ship's company than the *proper* utilization of the entertainment and physical values to be found in games and sports. This has of course long been recognized but has in many cases been carried to such a degree as to largely defeat its own ends—for athletics are only a means.

The following doctrine was laid down:

(a) An ideal system of athletics imparts the greatest good to the greatest number.

(b) Ship's work and training must at no time be interfered with by athletics.

(c) Special privileges to athletes were not granted except in very exceptional cases just prior to bouts or races.

(d) All athletics were under the direct supervision of an officer.

The following organization was laid down:

Athletic officer .....executive officer
Assistant athletic officer ....first lieutenant
Property officer ....assistant supply officer
Head trainer .....assistant medical officer

Officer in charge interdivisional contests.. .....lieutenant

Boxing and wrestling: head of department in charge; ship's teams—one officer assistant; interdivision—one officer.

Baseball: head of department in charge; ship's team—one officer assistant; interdivision teams—one officer.

Football: head of department in charge; ship's team—one officer assistant; no interdivision.

Soccer: head of department in charge; ship's team—one officer assistant; interdivision—one officer assistant.

Rifle shooting: head of department and one officer assistant.

Rowing: head of department and six officer assistants.

Sailing: head of department and one officer assistant.

Swimming: head of department in charge; ship's team—one officer assistant; interdivision—one officer assistant.

Track: head of department in charge; ship's team—one officer assistant; interdivision—one officer assistant.

Tennis, golf, and fencing: head of department.

In general every officer and warrant officer in the ship had specific duties to perform either in connection with the athletic or entertainment organization of the ship.

Ship's Service and Ship's Store

The many morale activities of a ship require a constant supply of funds. The large sums necessary were a source of surprise and some consternation to the executive officer. Experience showed that a budget to cover all sports, entertainments, ship's parties, emergency fund for use in case of distress, etc., would require in the neighborhood of $1,200 per month. From what source was this comparatively great sum to be drawn?

The agencies for making money in the ship are: (1) the ships' store; (2) the ship's service store; (3) the tailor, cobbler, laundry, etc.

The ship's store is under the management of the supply officer; it is distinctly an official institution, with profits limited to 15 per cent by law; its records are held accountable to the last toothbrush. Its profits averaged about $300 per month—just enough to take care of the cost of the charges for motion-picture service. This store was necessarily in charge of one yeoman. If this man were absent the store must be closed curtailing both service to the crew and the profits to be counted upon. After two years the happy expedient was hit upon of having a main store and a branch and this solved our problem immediately. One store or the other was kept open at all times—both whenever possible. The service to the crew and the profits were almost doubled without lack of proper accountability at any time.

The ship's service store is an organization sanctioned by regulations but of somewhat unofficial character. There is no limit to the profits to be made from the goods sold therein but one is not allowed to carry any goods authorized to be sold in the ship's store. This was a serious handicap until permission was obtained from the department to install a soda-water fountain and to sell ice cream, etc., in the ship's service store. Immediately our problems were solved and adequate funds made available, the prices at the same time being kept low. Profits from the tailor, cobbler, laundry, etc., never ran to any great sum.

Information Service

One of the most vexing problems which confronts the executive officer is the dissemination of information in such a method as to get the "news" out to every man in the crew. That ignorance is no excuse under the law is, of course, true but much dissatisfaction can be avoided if a proper system of publication of orders, notices, etc., is at hand. An "information officer" was appointed and a study made of this subject.

After a careful survey strategic locations were chosen for bulletin boards and enough constructed to bring the total number up to sixty. Special lights were placed over these boards. An "information yeoman" (additional duty) was furnished whose duties were to post all orders and notices and under the direction of the information officer keep the boards alive and up to date.

A subscription to a photo news agency was sent in which gave us a large photograph with description of some news event. We got these for two months back to begin with and by changing their location every day the men were kept continuously interested in looking at their bulletin boards and invariably read the orders and notices posted

thereon. It became very easy to get information and orders out efficiently.

THE SHIP'S PAPER

An editorial board was appointed for the management of the ship's paper. The information yeoman (finally a seaman second class) collected information and news from all sources and a very interesting "Daily News Letter" was issued each day. Copies of this letter were posted each afternoon on the bulletin boards. This letter was used for ship's news only—both official and unofficial; it consisted of only one sheet sometimes adorned with cartoons, and was quite valuable.

MESSING

The crew.—The Navy ration is adequate, is in general well prepared, and fairly well selected. Its serving is quite another matter and is a problem which was never wholly solved during the duty of the writer as executive officer. This failure was largely due to lack of facilities (room) and is worthy of study and consideration in almost all of our older ships. To get the food hot and appetizing to the men in just quantities is the problem. One general rule worked well: *"There will be no early messes allowed."*

The food was inspected *on the tables* by the executive officer once a day. Division officers were required to make a similar inspection once each week. The head of department with the day's duty was required to inspect at least one meal a day. There was also the officer of the deck's ration.

The medical officer scrutinized the menu when submitted to the captain through the executive officer and made many pertinent suggestions from the standpoint of dietetics.

Officers' messes.—The subject of proper administration of officers' messes is many times neglected by executive officers, but as "morale begins at the top" he should spare no effort to make his officers comfortable and to live in a manner befitting their rank. The mess bill need never run over twenty-five dollars in a properly administered mess. It was found that at least two officers were required to run the mess—a treasurer, and a mess manager who had to do with the general running of service to the officers.

PROFESSIONAL COMPETITION

The old pride in craftmanship is liable to extinction in this day of machines. To excite interest in distinctly craft excellence the captain directed that a "Professional Field Day" be held during which all the men would compete one with another in their rating. As a matter of fact this competition stretched over a period of about two months. Under the direction of an officer, boards of chief petty officers examined men both theoretically and practically and assigned standings. In addition to these examinations the boatswain's mates piped calls; the seamen turned out specimens of marlinespike seamanship and palm and needle work; the cooks cooked and the bakers baked; the yeomen had speed and accuracy tests; the machinist's mates turned out lathe work; the gunner's mates had speed and accuracy competitions; etc., winding up in a final day when the admiral came aboard, examined the specimens of handicraft and awarded twenty-six handsome gold watches inscribed, "To John Jones—the best man in his rating aboard the U.S.S.———19—".

PRIZES

No money prizes were permitted in athletic competitions nor was any man rewarded for participation in entertainments with money. But money prizes were given for: (a) the cleanest mess for the week, $5.00 (this was most beneficial and the condition of the messes steadily improved); (b) the best boat, $5.00—every Saturday morning each boat was brought alongside by its coxswain, a board consisting of the first lieutenant, the carpenter, and the boatswain then inspected. A lieutenant examined the coxswain in the Rules of the Road.

PERSONNEL INSPECTION

The captain wisely came to an early decision that he could not give to each man of the crew at quarters a careful and minute inspection during the short time available. He ordered the following procedure: head of departments or senior lieutenants (one for each detail) inspected for hair cuts, hats, shoes, neckerchiefs, and regulation uniforms, and noted on printed form any discrepancies revealed. The captain assigned to each division a mark (on the scale of 100) on the general military appearance of a division. A competitive standing based on the captain's mark less discrepancies was posted before noon with the names of the division officers leading boatswain's mates.

"AS *BEFORE* EXCEPT"

The "Oregon" Steams 15,770 Miles to Battle

By Lieutenant Commander H. A. Gosnell, U. S. Naval Reserve

THERE need be no fear that the famous run of the *Oregon* will be forgotten soon. It was an outstanding performance in naval engineering, unequaled before or since by ships of her type. Nations are no longer building large warships with coal-fired boilers and reciprocating engines. The record of the *Oregon*, therefore, is likely to stand for all time. There is grave danger, however, that all of the engineering details and perhaps many of the main features of the cruise will be lost beyond recall. The present writer, therefore, made a study of the original engine-room logs of the old ship—just before they were to be crated up and consigned to oblivion. Most of the information in the following pages was obtained from these logs, some from official documents. The old records of this long race against time are of intense interest. It is only hoped that some of the romance can be transmitted to this much shorter tale.

The "Oregon"

In order to obtain a perspective of the cruise of the *Oregon* it is perhaps fitting at the start to review in a few words the route and the dates, together with some of the major characteristics of the ship itself. Omitting a couple of unimportant stops, the *Oregon's* run was from Bremerton, Wash., to Santiago, Cuba, via the following ports: Mare Island, Calif.; Callao, Peru; Punta Arenas, Chile; Rio de Janeiro and Bahia, Brazil; Bridgetown, Barbados; and Key West, Fla. The *Oregon* left Bremerton March 6. War was declared April 21, the date of her departure from Punta Arenas. Cervera left the Cape Verdes April 29 and reached Santiago May 19. His whereabouts was discovered May 29. The *Oregon* with several other ships hove to off the Morro on June 1.

The *Oregon* was a 10,300-ton battleship mounting in her main battery four 13-inch, 35-caliber, and eight 8-inch, 30-caliber guns. Her armor belt along the water line was eighteen inches thick and the big-gun turrets and barbettes were, respectively, fifteen and seventeen inches in thickness. She had been completed only two years before the war with Spain and was one of the most powerful ships afloat at the time. She was driven by two 3-cylinder, triple-expansion engines which developed over 11,000 indicated horsepower.

The boiler installation is perhaps the most important feature in connection with this great run around South America. There were four main and two auxiliary boilers, all fire tube, of course. The main boilers were double-ended with four furnaces in each end and were fired from eight rooms. Each boiler contained 4,200 square feet of heating surface. The auxiliary boilers were single-ended and had three furnaces apiece. Although the heating surface of these two boilers was more than 11 per cent as great as that of the four main boilers it appears that they were never used at sea, even when the utmost speed was desired. It is interesting to note that the two small boilers used the closed ash-pit system of forced draft.

Although the preceding paragraphs are written in the past tense it should not be forgotten that the *Oregon* is still afloat, being maintained by the state of Oregon as a historic relic. Most of the principal characteristics and installations outlined above are still to be found today, although in all likelihood the ship will never sail the seas again.

Cast Off!

Let us, then, get under way. The *Oregon* is at the Puget Sound Naval Station, the base most distant from the scene of coming hostilities. She has been overhauling for the past three months—a big thing for the little navy-yard town of Bremerton. She is the first and only big ship that the yard has

had under its care. But a crisis is approaching far, far away. On March 7, Mr. John D. Long, Secretary of the Navy, wires the commanding officer: "The situation is getting worse. You should go to San Francisco as soon as possible and get ammunition."

Typical of the enterprise of the great battleship, she had already started before this message was sent. Early on a Sunday morning, March 6, she stood out of the narrow, rocky channel into Puget Sound. A day of inland cruising, the ship dwarfed to a mite by the massive Olympic mountain range, and the voyage had begun. Her splendid steaming qualities were at once in evidence. The contract speed under natural draft was fifteen knots. On the run to Mare Island an average of over eleven knots was maintained on three boilers with never an effort to force her. In fact she steamed many of the hours at a low standard speed. (The speeds and miles mentioned in these pages are measured through the water and were derived from readings of the counters and the patent log.)

Three days en route and ten days at Mare Island. Soon after arrival, another dispatch from Mr. Long:

> When in all respects ready for sea proceed, with the vessel under your command, to Callao, Peru, and await further orders.
>
> In view of the present critical condition of affairs, the *Oregon* should leave San Francisco at the earliest possible date and arrive at Callao as soon as practicable.
>
> The crew is to be constantly drilled, the passage of the ship not to be delayed thereby.

Two days before departure, Captain C. E. Clark took over the command. Captain Clark's high esteem is partially derived from the record made by the *Oregon* during the long cruise from Bremerton to Santiago and during the battle. This is eminently proper. At the same time no one should lose sight of Chief Engineer R. W. Milligan, U. S. Navy. The spectacular performances of the department under his care added much to the *Oregon's* fame.

The Golden Gate Astern

At Mare Island 1,127 tons of coal were taken aboard for the first long leg of the 15,000-mile run. This load filled the bunkers to within five tons of their utmost capacity of 1,594 tons. With ammunition and all stores in like abundance the *Oregon* was indeed ready for the test. On March 19 the West Coast's lone battleship got under way and stood down sunny San Pablo Bay. Sixteen days' steaming followed—the longest stretch of the entire voyage. This covered the distance of more than 4,000 miles to Callao, Peru.

The long run to the land of the Incas was made on three of the four main boilers and with splendid results. A speed of 10.6 knots was made standard for virtually the entire distance. The main engines throughout these many days required not the slightest repairs or adjustments. This remarkable record was maintained throughout every minute under way up to and through the battle itself—months later. No departure was ever delayed. A negligible amount of boiler trouble was experienced between Mare Island and Callao. On two occasions a boiler on the line developed slight leaks. It was cut out and the idle boiler cut in after a total net loss of only fifteen miles, approximately. This was entirely inconsequential. There was no attempt to make up the revolutions though this could have been accomplished very easily. In fact, standard speed was slightly reduced during the last few hours of the run in order to reach Callao at a reasonable time of day.

The Gunboat "Marietta"

The anchor was let go early on the morning of April 4, marking the start of a busy period for the "black gang." Here enters the U. S. gunboat *Marietta,* Commander F. M. Symonds commanding. Less than two weeks before, the *Marietta* was at Panama. There she received orders from Washington to proceed to Callao and make arrangements for coaling the *Oregon.* It was through the expeditious action of Commander Symonds that the coal was on lighters ready to go alongside the *Oregon* the minute she arrived. Without waiting even for her arrival the *Marietta* pushed on ahead to make similar arrangements at Punta Arenas. Both of these coaling appointments were invaluable factors in the success of the *Oregon's* dash to the East Coast.

Three feverish days of coaling were spent in the open Peruvian harbor, 1,137 tons of fuel being loaded. The bunkers were filled to the last cubic foot and a deck load of 100 tons was taken on in addition. The

short squat battleship put to sea then with nearly 1,700 tons of coal aboard. There followed unusually miserable days for the fireroom force. Slight leaks in one of the steaming boilers had been discovered and calked shortly after anchoring. The day before departure all four main boilers were examined carefully, leaks being found in all of them. Three were quickly calked. One, however, was not ready for service again until the second day at sea. The day before this, the speed was notched up. The order was, "maximum speed with natural draft" —later modified to a maximum of 13.7 knots. The fourth boiler was thus available thirty hours late, netting a loss of about sixty miles or five hours.

140 Degrees in the Firerooms

Conditions were very bad for the firemen, coal passers, and boilermakers. A fireroom temperature of 140 degrees was not at all unusual. Striking down the deck load of coal did not add to anyone's pleasure. Three days after the fourth boiler had been cut in, another one of the four started to leak. Before all boilers were again on the line, over eighty more miles had been lost. The long run from the Golden Gate had apparently shown up every weakness. Perhaps the most remarkable feature of this story of boiler trouble is that the virtual end was reached right here. A mighty fine performance for Scotch boilers of the nineties—or of any other period.

On April 9 the thermometers in the firerooms read 150 degrees.

Solid Seas over the Jack Staff

The run from Callao to the Straits of Magellan required just nine days. An average speed of more than twelve knots was maintained despite the reductions mentioned above. Captain Clark, in reporting southerly swells, stated that *the jack staff often disappeared under the solid seas.* "The vibrations and the racing of the propellers were very marked at times but the condition of affairs and the Department's instructions warranted a high rate of speed." War was becoming more imminent every day and the course was still south.

The *Oregon* entered the straits at 3:30 P.M. on April 16. At this point the eleven hours lost from boiler trouble earlier in the run were sadly missed—as luck would have it. It was too late in the day to run through to Punta Arenas. Decision was made to anchor for the night at Port Tamar, Chile. Thus twelve more hours had to be sacrificed. Before an anchorage could be reached a terrific gale of wind and rain struck the *Oregon.* The treacherous Patagonian coast was wiped from view. No soundings could be obtained. Nightfall was at hand. The ship was then probably closer to destruction than at any other time in her entire career. The forbidding straits seemed once more about to take their toll. Captain Clark reports, apparently with great thanksgiving:

> Just before dark the anchors were let go on a rocky shelf, fringed by islets and reefs, in thirty-eight and fifty-two fathoms of water and they fortunately held through some of the most violent gusts I have ever experienced.

The Straits Are Passed

No time was lost the next morning in getting on to Punta Arenas. Under way at 6:00 A.M., all boilers, throttles wide open, fireroom blowers in operation, though the firerooms were kept open. This was the first of the *Oregon's* three spurts at full or near full speed. And right well did she respond. After working up to speed, turns for well over fifteen knots were averaged for eight full hours. Sixteen knots were approached at times. This was an extremely noteworthy performance under assisted draft only.

The *Oregon* arrived at Punta Arenas (Sandy Point), Chile, after a twelve-hour run. It might be said that she was twenty-four hours late. She beat the *Marietta* in by a few hours, however. The latter vessel had left Callao ahead of the *Oregon* but had been ordered to stop at Valparaiso en route. This resulted in the coaling arrangements being not quite perfect. By use of telegraph Captain Symonds had the coal ready but he had not been able to plan the final details on the spot as at Callao. As a result, the hulk containing the *Oregon's* coal was also loaded with wool. The necessary shifting of cargo increased the labor of coaling ship to a considerable degree. The intense zeal of the whole crew, however, prevented any delay. The entire load of 500 tons was taken aboard in forty-eight hours, the men working day and night. So anxious were they to complete the job that most of the crew preferred to leave their hammocks in the nettings until coaling was finished.

NORTHWARD BOUND

The *Marietta* was to sail with the *Oregon*. The departure was expedited by the good will of the Chilean officials who allowed the gunboat to take government coal. She had been greatly favored at Valparaiso too. Of course war had not yet been declared, else such procedure would have been unneutral.

Now it so happened that the little "squadron" left Punta Arenas early on the morning of April 21, the very day war was declared. Thus they were unaware of the situation during the entire run to Rio, although war was known to be extremely imminent. There was no radio in those days. And the Spanish torpedo gunboat, *Temerario*, had been reported to Captain Clark as being at Montevideo, right on the *Oregon's* course. (This vessel had a displacement of 600 tons and a rated speed of twenty knots.) Even from the time of leaving Punta Arenas, therefore, the *Oregon* and the *Marietta* steamed under war conditions—to be on the safe side. So, whenever at sea, from April 21 until after the battle (on July 3) it was: "Full speed at a moments' notice."

Course of the *Oregon* on her famous run of 15,770 miles. She left Puget Sound March 6 and arrived off Santiago de Cuba June 1, 1898.

In port it was: "Ready to get under way at a moment's notice." Not a restful situation. But there was at least some physical rest for the fireroom force from Sandy Point to Rio. The *Oregon* was made to conform in speed to the slower *Marietta*. The average for the nine days and ten hours was little over ten knots, an easy proposition for a fine steamer like the *Oregon*, with all boilers cut in. This was a great relief after the punishing trip from Mare Island to the straits. The black gang couldn't be licked, though. Often on the run to the south there were instances of men who had been carried out of the firerooms, trying to get back again after being revived. And now they were northward bound, headed for the scene of action.

"Remember the Maine"

There was plenty of news upon arrival at Rio de Janeiro on April 30. War had been declared April 21. Cervera had left the Cape Verdes April 29, "headed west, destination unknown." The *Temerario* had left Montevideo, bound "probably for Rio." The most intensive precautions were therefore taken against any eventualities which might arise should the *Temerario* indeed appear. The *Oregon's* two steamers were kept on picket duty at night. The *Marietta* had orders for the employment of her steamer and her searchlight. The Brazilian government had a warship ready to stand by the *Temerario* during all of her stay in Brazilian waters. Captain Clark was naturally a bit anxious after the *Maine* episode.

During the three days and four nights spent in this harbor of scenic grandeur more than 1,000 tons of coal were taken aboard. On this occasion, coaling ship was not so arduous, as laborers from ashore assisted. The *Temerario* never put in an appearance.

At this point, however, the *Oregon* was burdened with another drag upon her speed. Splendidly though the *Marietta* had steamed from Punta Arenas to Rio, the *Oregon* could have lopped off a full day from the run had she made it alone. And now it was the wretchedly boilered steamer *Nictheroy* which the *Oregon* must escort. (The *Nictheroy* soon became the *Buffalo*. She was stricken from the Navy list in 1927 and has since been sold.) The *Oregon* and *Marietta* finished coaling and stood out to sea early on the morning of May 4. The Brazilian neutrality regulations necessitated an interval before the sailing of the *Nictheroy*. Although this vessel had reported ready when the *Oregon* sailed she did not appear that night where the *Oregon* and *Marietta* had anchored. She turned up late the next afternoon, then broke down once more. Finally Captain Clark was unwilling to delay longer. He struck out by himself about 10:00 P.M. of the second day, having covered not a great deal more than 100 miles since leaving the harbor almost forty hours before. Thus one more full day was wasted.

Alone Again

The goal was Bahia, Brazil, 850 miles away. A troublesome bunker fire burned from May 7 to 8, necessitating the use of a working party from the deck force to dig it out and extinguish it. Under easy steam from all four boilers the *Oregon* reached Bahia the night of May 8. After communication with Washington the battleship was on her way again the next night. No coal was taken aboard. Any further weight would have brought the armor belt dangerously below the water line.

The *Oregon* headed for Bridgetown, Barbados, 2,250 miles from Bahia; four boilers, 11.4 knots—easy steaming. It was during this run that contact with Cervera was possible. His squadron had not yet reached Santiago when the *Oregon* arrived at Bridgetown. Cervera, it was learned later, had passed Barbados close aboard. A peculiar situation existed. No one was aware of Cervera's exact location. Cervera was not even aware of the *Oregon's* departure from the West Coast. The *Oregon* realized the possibility of meeting Cervera's four armored cruisers and three destroyers. Captain Clark had planned a running fight. The strange feature, as we now know it, is that not one of the cruisers could have caught the *Oregon*. The deficiencies of the enemy squadron were inconceivably great. If a stand-up battle had been started and fought through in some way, the *Oregon* without much doubt could have destroyed every Spanish ship. This would surely have been a strange beginning and end to the naval war in the Atlantic!

HOME

The *Oregon* reached Bridgetown without incident early on May 18 after a run of eight days, and a quarter. Here she took on 240 tons of coal—all that was allowed—and then weighed anchor the same night. The *Oregon* was indeed near the end of the trail now. Speed was increased. On the last long run of almost six days an average of nearly twelve knots was maintained. She reached Jupiter Inlet, Florida, on May 24, having been away from home ports for over two months.

The Secretary of the Navy ordered the *Oregon* if ready for service to proceed to Key West, otherwise to Hampton Roads. So, of course, Key West it was. Jupiter Inlet was dropped astern the next day and the anchor was let go at Key West on May 26 after a run of twenty-seven hours. At Key West came the felicitations. Secretary Long wired: "The Department congratulates you, your officers, and crew on the completion of your long and remarkably successful voyage." Captain Clark replied in part: "I have the honor to acknowledge the Department's telegram of yesterday which was received and read to all hands at muster the same evening, causing great enthusiasm and spontaneous cheers."

But the voyage was not yet really over. Little more than 200 tons of fuel remained in the bunkers, so the ship had to be coaled again. Eight hundred tons were taken aboard. After three days and two nights at Key West the *Oregon* stood out at midnight on the night of May 28. She was assigned to the northern blockade (of the coast of Cuba). She crossed the straits and before noon hove to on her station about 100 miles east of Havana. This was the first steaming done on three boilers since entering the Atlantic. Here was the real end of the great voyage, the goal for which all had been striving these many weeks. The *Oregon* had covered 15,230 miles from Bremerton in eighty-four days and five hours total elapsed time. She had joined the fleet and was ready for any eventuality.

BARELY IN TIME

This was May 29, it will be remembered. It was on that very day that Cervera's presence at Santiago was definitely determined. The next day word got through to the *Oregon* to proceed to that port. She was under way at 9:00 A.M. Thus it will be seen that she was on duty and ready for important orders when they came. The margin was a scant one—less than twenty-four hours; but this must be all the greater satisfaction to those who had driven the ship around a continent. They had made the utmost practicable speed while ignorant of the date when the ship might be needed. That the *Oregon* arrived and was on station just in time to be employed is a fact which has been almost completely lost sight of. This brings to mind the time lost on the way around: one day through boiler trouble in the Pacific; one day holding back with the *Marietta* from Sandy Point to Rio; one day waiting for the *Nictheroy* before leaving her behind. At the time, it was not realized how close to zero these lost days were to shave the margin at the end. But she made it, so all credit to all hands.

Although the *Oregon* arrived on time, the dramatic nature of her trip brought a never forgotten attention to the military desirability, almost necessity, of a canal across Central America.

WAR

Thus ended the less spectacular phase of the *Oregon's* service, though it was the part which was of longer duration and greater importance. Her work from the discovery of Cervera's ships up to their destruction also caught the popular fancy. Here again her engineering performance was superlative, in two instances. That the ship was capable of such reliability and speed after 15,000 miles is merely another tribute to her installation and to its handling during the run from Puget Sound. The "Chief" and his subordinates were the heroes here. The watch officers were Passed Assistant Engineer C. N. Offley, recently deceased; Assistant Engineer F. Lyon; and Naval Cadet H. N. Jenson, both now retired as captains; Assistant Engineer J. M. Reeves, now Rear Admiral Reeves in command of the Aircraft Squadrons, Battle Fleet; and Naval Cadet W. D. Leahy, now Rear Admiral Leahy, Chief of the Bureau of Ordnance.

SANTIAGO DE CUBA

The run to Santiago required nearly two days at an average speed of just under twelve knots. For several reasons there was a good deal of variation from this aver-

age. In the course of the first day, turns for as much as fifteen knots were occasionally ordered for short periods. The *Oregon's* fourth main boiler had been put back on the line as soon after the start as possible. The large peak load capacity of the big Scotch boilers made it possible to take care of these temporary demands without a great deal of difficulty. On the second day, however—May 31—the firemen ran into some pretty bad coal. There was even difficulty in supplying the short demands for fourteen knots, the maximum after the first day. Could this coal have been supplied to the Navy by the same patriots who furnished the Army with the embalmed beef? At any rate the fires were in wretched shape in no time, requiring continual working. The fireroom force was not large enough to do this additional heavy work expeditiously. Assisted draft had to be used once for forty minutes on two boilers and again for the same length of time on all four.

A Spurt of Seventeen Knots

The *Oregon* finally arrived off the entrance to the harbor of Santiago on June 1 and hove to. In company with her were the *Mayflower*, *Porter*, and *New York* (Admiral Sampson). Already on the scene were most of the other ships which maintained the blockade until the end. The *Oregon* had reached the end of the trail, 15,770 miles from Bremerton. Her average speed for the entire distance was only a shade under eleven knots—a remarkable performance.

For a time there was no rest for the big fighter. On the very next day a ship had to be chased. The *Oregon* with her great steaming record was honored by being selected for the task. She responded with an extraordinary exhibition. Under forced draft but starting from a standstill the battleship averaged 15.5 knots for the entire period of two hours and forty minutes under way. This included the lengthy period required for a ship with cylindrical boilers to work up to speed. The log records that 125 revolutions per minute were turned up at times. This is equivalent to seventeen knots. It will be remembered that this was her contract speed (under forced draft); and it should not be forgotten that she made less than 16.8 on her four-hour trial. She had not been in dry dock since February 16; and in 1898 anti-fouling paint was not what it is now. On this day, moreover, she carried over 700 tons of coal, the normal supply being 400.

Then followed the long days of the blockade, the *Oregon* hove to and ready for maximum speed at a moment's notice. She took part in the abortive bombardments of June 6 and 16. One of her steamers was always on picket duty at night, close in to the harbor entrance. The *Oregon* received coal from colliers twice while on station and made round trips to Guantanamo Bay for the same purpose on June 10 and 17. In each case the amount of fuel taken aboard was small. On June 26, however, she went to Guantanamo once more, stayed over night, and took on 700 tons. This was an unfortunate break of luck, for the result was that she had an abnormal weight aboard for the great race on the day of battle.

On the way back, there occurred the single main engine casualty which delayed the ship in any way during her entire war service. A gasket on a valve chest drain blew out, causing a stop of twenty minutes. It seems quite marvelous that delay was caused by this one item alone of all engine-room adjustments and repairs necessary throughout the thousands of miles covered and the months of time elapsed since leaving Bremerton. And then a delay of less than a half hour! Three days later a pinhole leak was discovered in one of the main boilers. The unit was cut out, repaired, and gotten back on the line again in thirty-six hours. This was the first boiler casualty since entering the Atlantic—and not a boiler was cleaned inside from the time the *Oregon* left Bremerton till after the Spanish fleet was destroyed. On July 2 the liquid was lost out of the steering accumulators, putting the hydraulic steering gear out of commission for three minutes. These three minor casualties, all occurring between June 27 and July 2, were the only ones to handicap the ship in any way since April 12—a splendid record.

Blockade

The engineering practice employed by the various ships during the long days of the blockade is of great interest. This is particularly true of the *Oregon* as compared with the rest. From the very start of the long, long run Chief Engineer Milligan would allow no sea water to be fed into the

boilers. This was not regular practice in those days. The captain was even prepared to reduce the crew's allowance of fresh water in order to continue this procedure. It was foresight such as this which made possible the fine performance of the *Oregon* when the supreme test came. Secondly, some especially good coal had been obtained at one of the South American ports. The chief engineer had this coal locked up in the fighting bunkers for use when the day of battle arrived. He kept the keys himself.

Most interesting of all is the state of readiness—or unreadiness—of the various ships. Some carried on as if there were absolutely no possibility of Cervera coming out. Even when Santiago's fall was imminent—the time when Cervera would come out if ever—there still seemed to be little expectation of such a possibility. Most of the ships had died out the fires in half their boilers! The *Oregon* and only one other had all main boilers lit off and on the line when the great moment came. The *Oregon* had every main boiler on the line every minute from the time Cervera's squadron was discovered (apart from the one instance of repairs mentioned above). Her officers realized that an occasion was probably at hand for which the *Oregon* had been built—probably the only chance for action in her entire career. If it came they were going to be ready to the utmost possible degree. Captain Clark often discussed with his engineer officer the advisability of securing half the boilers to conserve fuel, as many other ships were doing. The "Chief" always recommended against it and his counsel prevailed. Long watches, coaling ship, trimming bunkers, overtime work in the tropical heat on adjustments and repairs—all of these he considered merely part of the job. Captain Clark and Milligan agreed that the officers and men of the engineer department would respond to any demands in order that their material might be instantly ready whenever the need for it should arise.

GENERAL QUARTERS!

So it was that the *Oregon*, almost alone, was ready on that clear, hot, Sunday morning of July 3. When the *Infanta Maria Teresa* slowly poked her nose out of the channel the *Oregon* immediately began to work up to full speed. At least one of the American ships had half her boilers not only off the line but even empty and with the manhole plates off. The forward tandem engines of both the *New York* and *Brooklyn* were uncoupled. If the Spanish cruisers had been able to deliver their rated twenty knots upon emerging from the harbor entrance, they would have gotten away without much doubt—temporarily at any rate. But at least the *Oregon* delivered her maximum speed and that right quickly.

The story of the battle is too well known for repetition in these pages. It was the *Oregon*, together with the 21-knot *Brooklyn*, that led the chase after the *Cristobal Colon*, the only Spanish ship to escape even for a time. Speed slowly increased. The fighting bunkers were unlocked. During this long chase following the first flurry—which was the real battle—the firemen were straining every nerve in the terrific heat. While the *Colon* was still out of range Captain Clark had some shells fired from the forward turret. The sound of the shots brought forth cheers in the firerooms and the pursuers would not be denied. The quarry was finally overhauled. When a 13-inch shell from the *Oregon* dropped beyond the *Colon*, the latter knew that the game was up. She had never received her main battery guns. There was nothing to do but head for the beach and haul down her flag. The battle was over.

The *Colon's* trial speed was over twenty knots, the *Oregon's* under seventeen. But the *Oregon* produced the results when they were needed, as did no other ship that day, friend or enemy. During the excitement of that great day the figures on engineering performance were not logged as meticulously as history might desire. It would seem, however, that the *Oregon* turned in as splendid a performance on July 3 as on June 2; and this in spite of the fact that the bottom was even more foul than before, due to another month in tropical waters. Moreover the coal she carried this day was 600 tons above normal. We have evidence that she was making sixteen knots before the *Viscaya* ran ashore—in other words less than two hours after the first alarm. It should always be borne in mind that the *Oregon* had big fire-tube boilers and that most of the fires were heavily banked at the start. From study of a number of sources there would seem to be little doubt that the "Bulldog of the Navy" again

TABLE I

Departed from	Arrived at	Under way			Miles from		Av. r.p.m.	Av. knots from		Tons coal		Boilers	Av. tons coal on ship*
		day	hr.	min.	revs.	pat. log		r.p.m.	pat. log	Fired	Per hr.		
Bremerton Mar. 6	Mare Island Mar. 9	3	03	15	835	857	77.3	11.1	11.4	216	2.87	3	630
Mare Island Mar. 19	Callao Apr. 4	15	23	30	3,990	4,176	73.8	10.4	10.9	980	2.55	3	1,070
Callao Apr. 7	Port Tamar Apr. 16	9	00	05	2,704	2,551	86.6[2]	12.5	11.8	795	3.68	3–4	1,300[1]
Port Tamar Apr. 17	Punta Arenas Apr. 17	0	12	17	168.5	160	94.7	13.7[3]	13.0[3]	77	6.25	4	850
Punta Arenas Apr. 21	Rio de Janeiro Apr. 30	9	09	57	2,260	2,306	71.8	10.0[4]	10.2[4]	656	2.90	4	900
Rio de Janeiro May 4	Sea May 4	0	13	30	50	71	39.4	3.7[5]	5.25[5]	20	1.48	4	1,540
Sea May 5	Bahia May 8	3	15	31	857	845	70.7	9.8	9.7	253	2.89	4	1,370
Bahia May 9	Bridgetown May 18	8	05	49	2,255	2,244	79.3	11.4	11.3	638	3.22	4	900
Bridgetown May 18	Jupiter Inlet May 24	5	22	45	1,700	1,687	82.3	11.9	11.8	486	3.40	4	600
Jupiter Inlet May 25	Key West May 26	1	03	13	269	?	71.0	9.9	?	81	2.98	4	300
Key West May 29	No. Blockade, May 29	0	11	10	90.7	89	62.7	8.1	7.9	26	2.32	3	1,000
No. Blockade May 30	Santiago June 1[6]	1	21	45	548	536	82.7	12.0	11.7	182	3.98	4	860
Santiago June 2	Sea June 2	0	02	40	41.4	?	110.4	15.5[7]	?	24	8.99	4	700
Santiago July 3	Sea July 3	0	03	50	54	?	97.7	14.1[8]	?	26	6.78	4	1,000

* Normal coal supply 400 tons; maximum bunker capacity 1,594 tons.

[1] 100 tons coal deck load taken aboard at Callao.
[2] Best speed, natural draft, but not more than 95 r.p.m.
[3] Throttles wide open; assisted draft.
[4] Conforming to *Marietta*.
[5] Waiting for *Nictheroy*.
[6] With *New York*, *Mayflower*, and *Porter*.
[7] Forced draft; throttles wide open; chase.
[8] Forced draft; battle.

TABLE II

Bremerton to	Miles steamed*		Time under way*		Total elapsed time			Av. knots under way*	Total consumption		
	Counter	Pat. log	hr.	min.	day	hr.	min.		tons coal	gals. lub. oil	gals. cyl. oil
No. Blockade	15,207	15,255	1,393	00	84	04	40	10.93	4,565	3,255	95
SantiagodeCuba	15,755	15,791	1,438	40	87	00	05	10.95	4,785	3,420	97
End of battle									5,757	4,609	111

* Does not include the few hours and miles on patrol and hove to.

reached seventeen knots before the end of this supreme test. The ship could not have rewarded her engineers' force more fittingly than by this response to the labor, care, and judgment employed upon her ever since that day so long past when she steamed out of the Puget Sound navy yard.

AS BEFORE EXCEPT

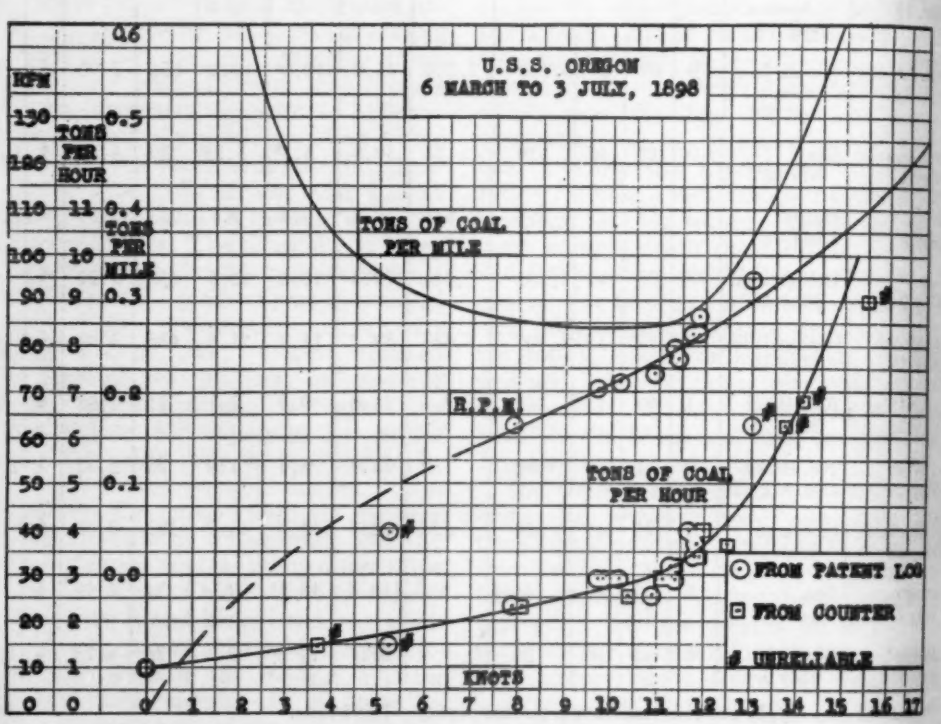
Let us close with a quotation from the laconic engine-room log, of the two watches covering the battle of Santiago.

8 A.M. to Mer. As before until 9:30 when went to general quarters, the enemy's fleet having come out of the entrance. Put forced draft on all main boilers at about 9:45 and began chasing. Continued running under forced draft for rest of watch, driving the enemy's ships ashore one by one. At end of watch only one ship remained which we were gradually overhauling.

C. N. OFFLEY
P.A. Engr., U.S.N.

Merid to 4 P.M. As before except shut down F.R. blowers & slowed down about 1:20 having destroyed the Spanish fleet. Worked to bells rest of watch. Sent up all men except division on watch at 2. Retreat from general quarters at 3 & secured "S" crane 3:30.

J. M. REEVES
Ass't Engr., U.S.N.



PERFORMANCE CURVES OF THE *OREGON* FROM BREMERTON TO SANTIAGO

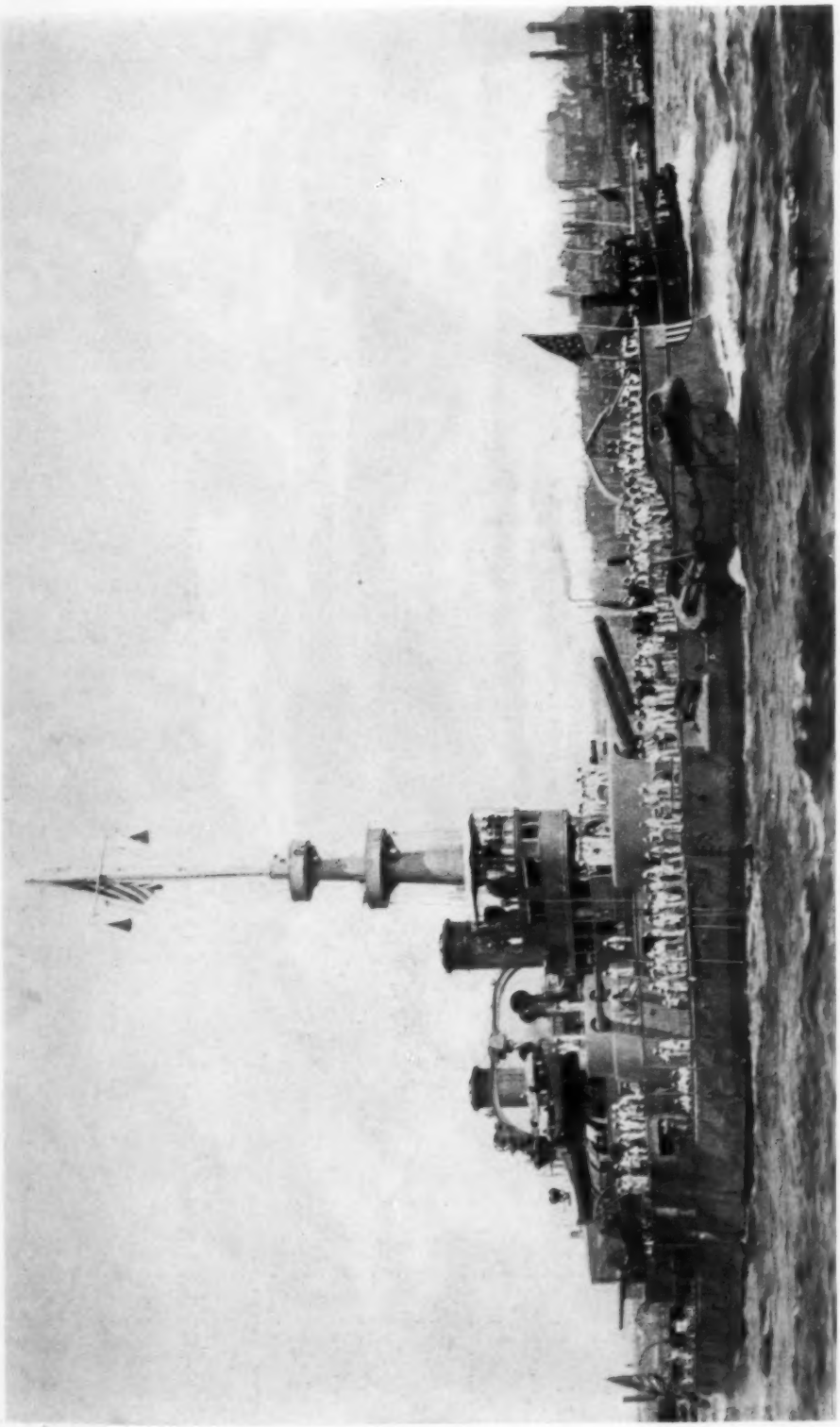
The r.p.m *curve* is drawn from data obtained some years later (with same propellers); r.p.m. *points* obtained in 1898.

Displacement figures not available for various legs of run; but throughout *Oregon* was loaded considerably beyond normal, as to coal, stores, and ammunition. (See Table I for amount of coal aboard.)

Approximately one ton of coal consumed per hour, hove to, all boilers on line, steam at throttle.

Adjustment of points for weather and displacement would bring them closer to the curves in the majority of cases, notably around ten to twelve knots on the tons-per-hour curve.

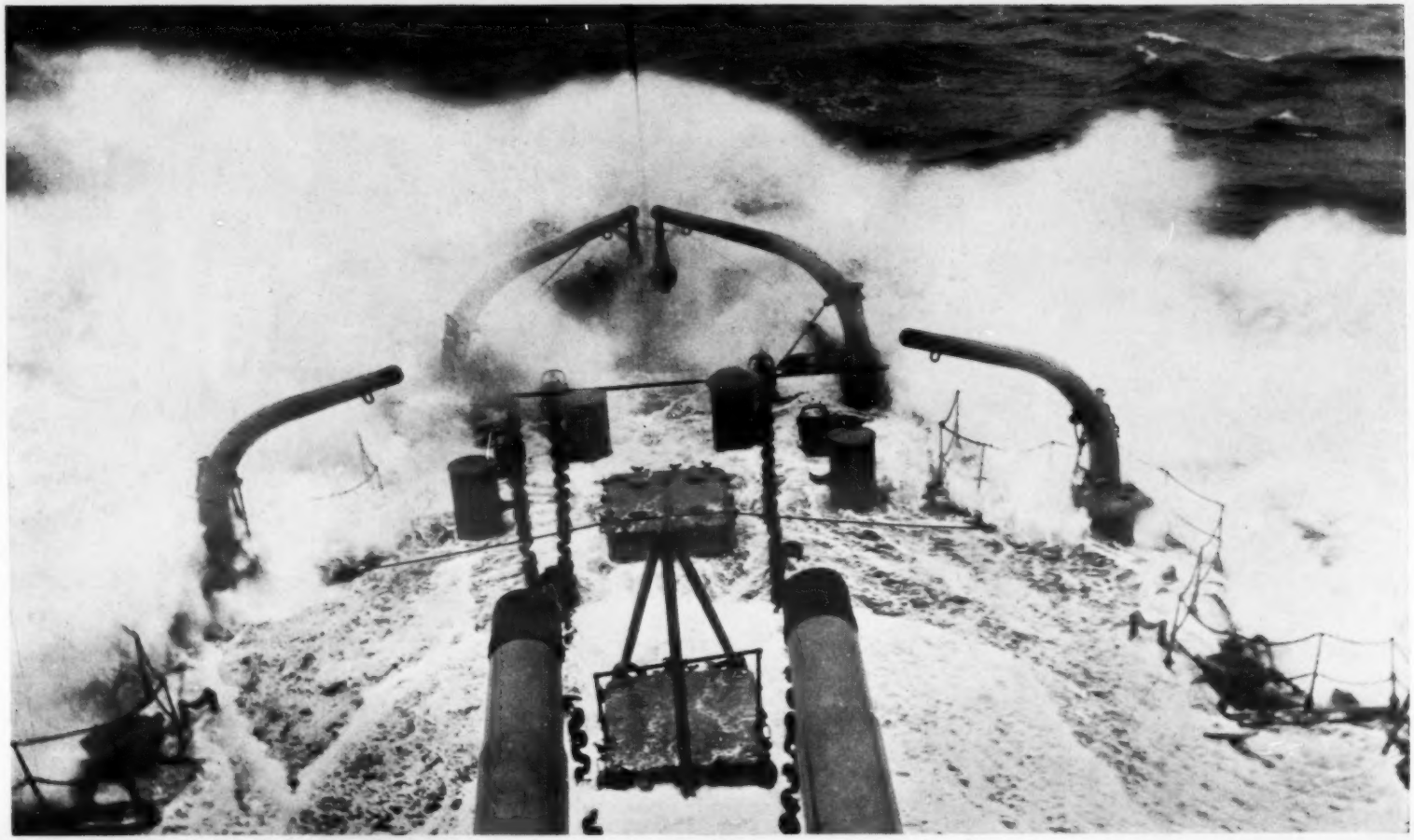
Tons-per-mile curve derived by calculation from tons-per-hour curve.



Courtesy Office of Naval Operations, Navy Department

THE TRIUMPHAL RETURN

U.S.S. *Oregon* enters New York Harbor soon after the treaty of peace is signed.



Courtesy Lieutenant Commander W. C. Tooze, U. S. Naval Reserve

U.S.S. *OREGON* IN A SEAWAY

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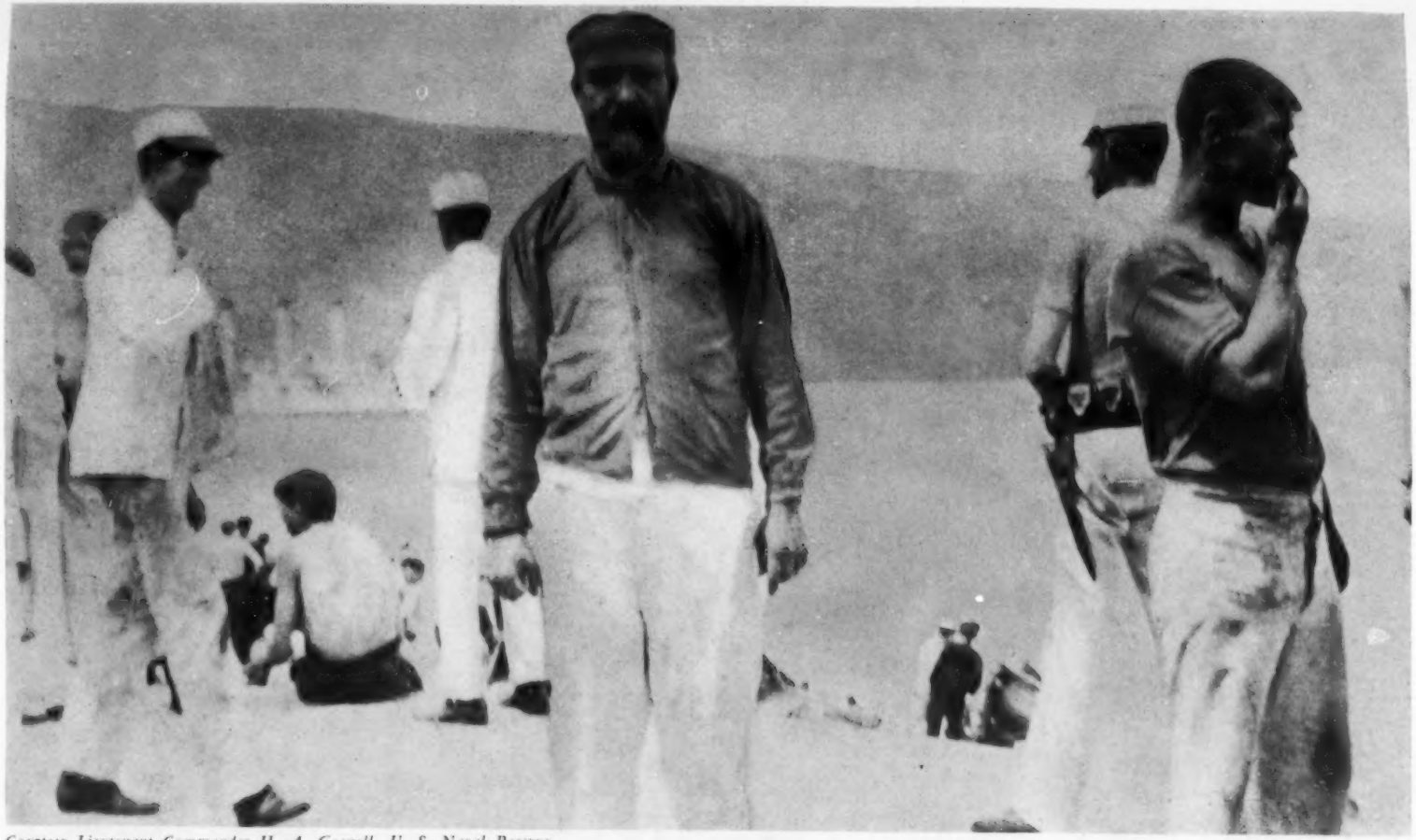
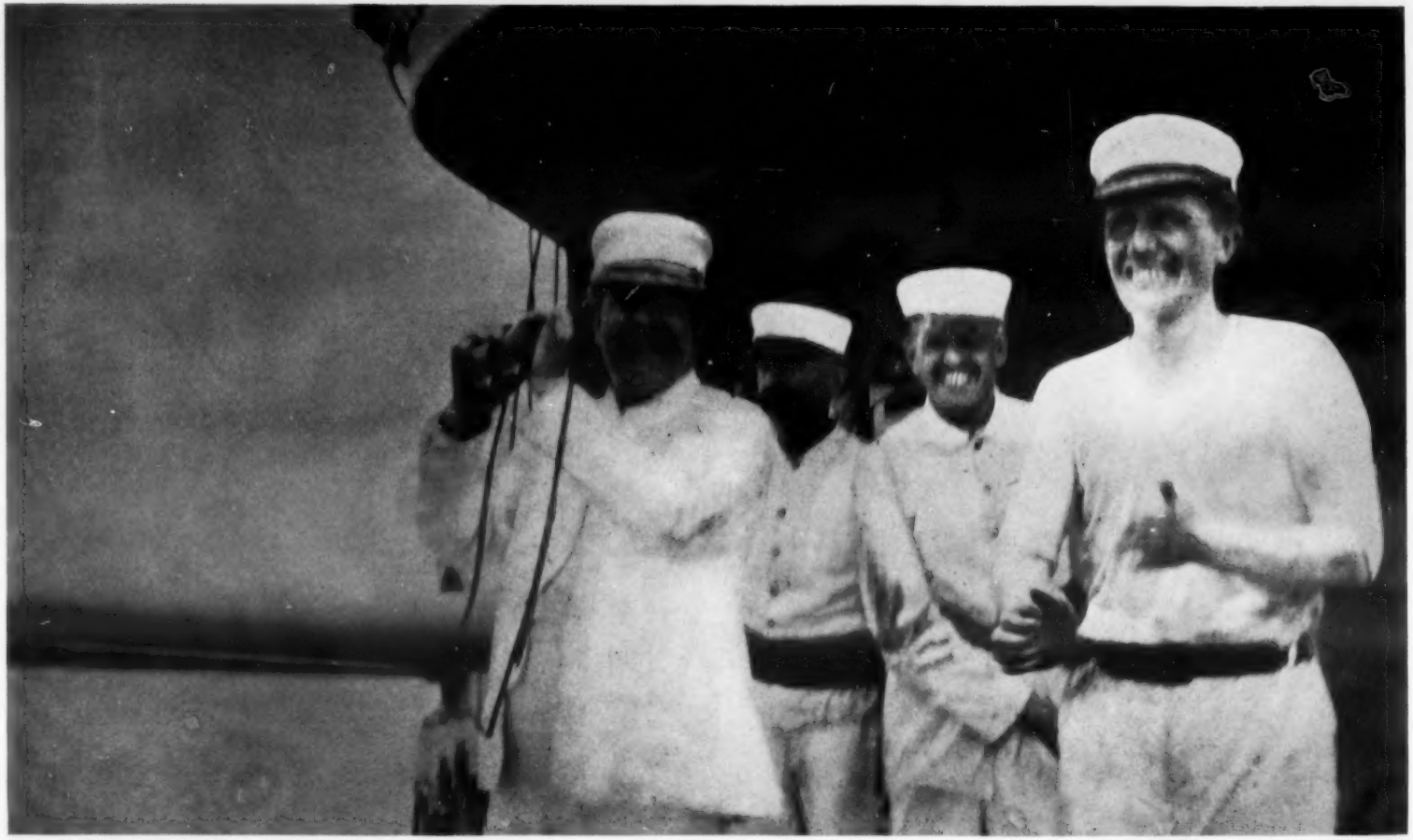


Courtesy Lieutenant Commander H. A. Gosnell, U. S. Naval Reserve

CHIEF ENGINEER R. W. MILLIGAN OF THE *OREGON*

This photo was taken immediately after the battle of Santiago. The run of the *Oregon* from the West Coast and her speed during the battle were outstanding engineering performances.



Courtesy Lieutenant Commander H. A. Gosnell, U. S. Naval Reserve

ACTION!

Captain Clark and Naval Cadet Overstreet of the *Oregon* watching a shot fired at the *Colon* during the battle of Santiago. The *Oregon* apparently has just pulled up within range.

Courtesy Lieutenant Commander H. A. Gosnell, U. S. Naval Reserve

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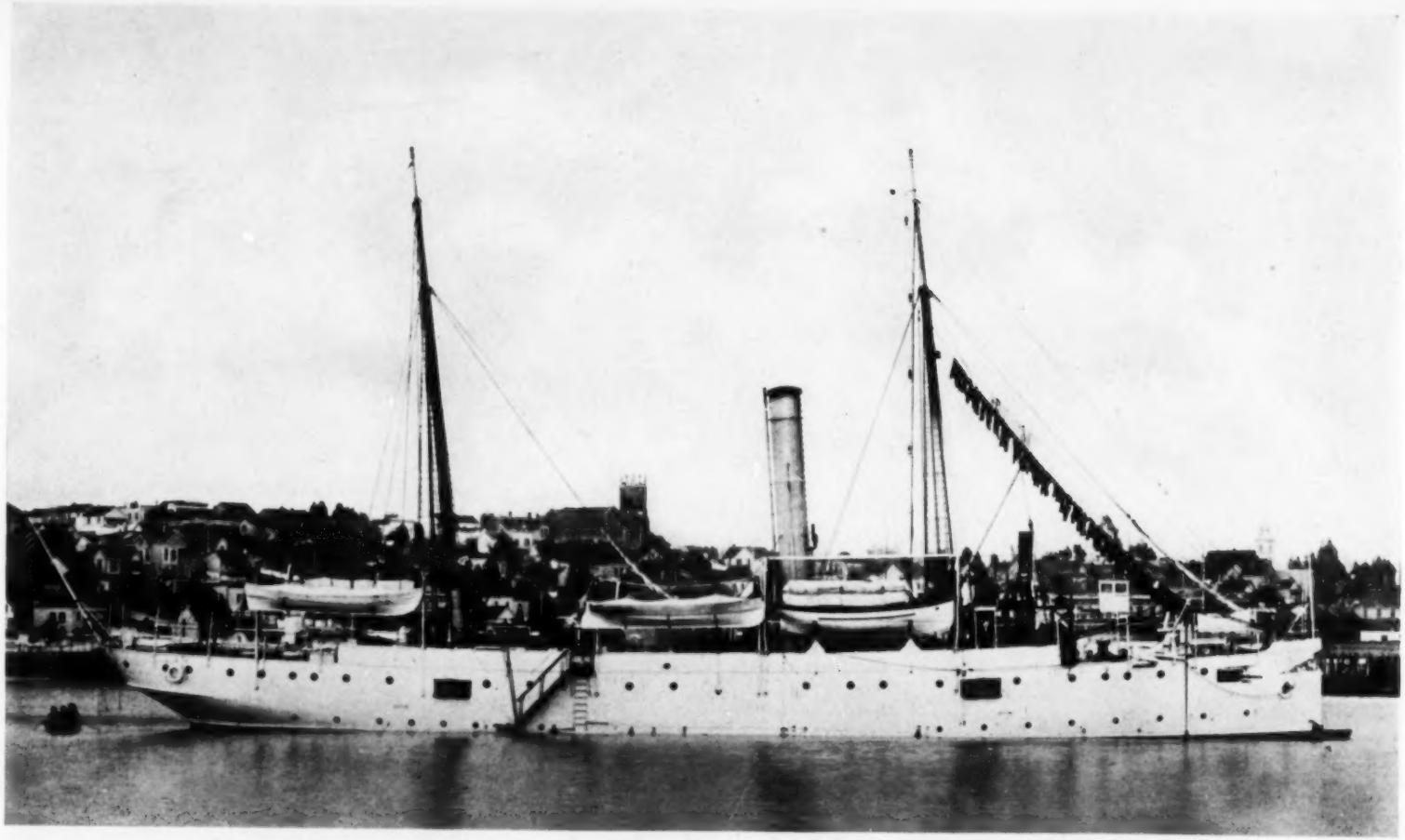


U.S.S. *MARIETTA*

Courtesy Lieutenant Commander H. A. Gosnell, U. S. Naval Reserve

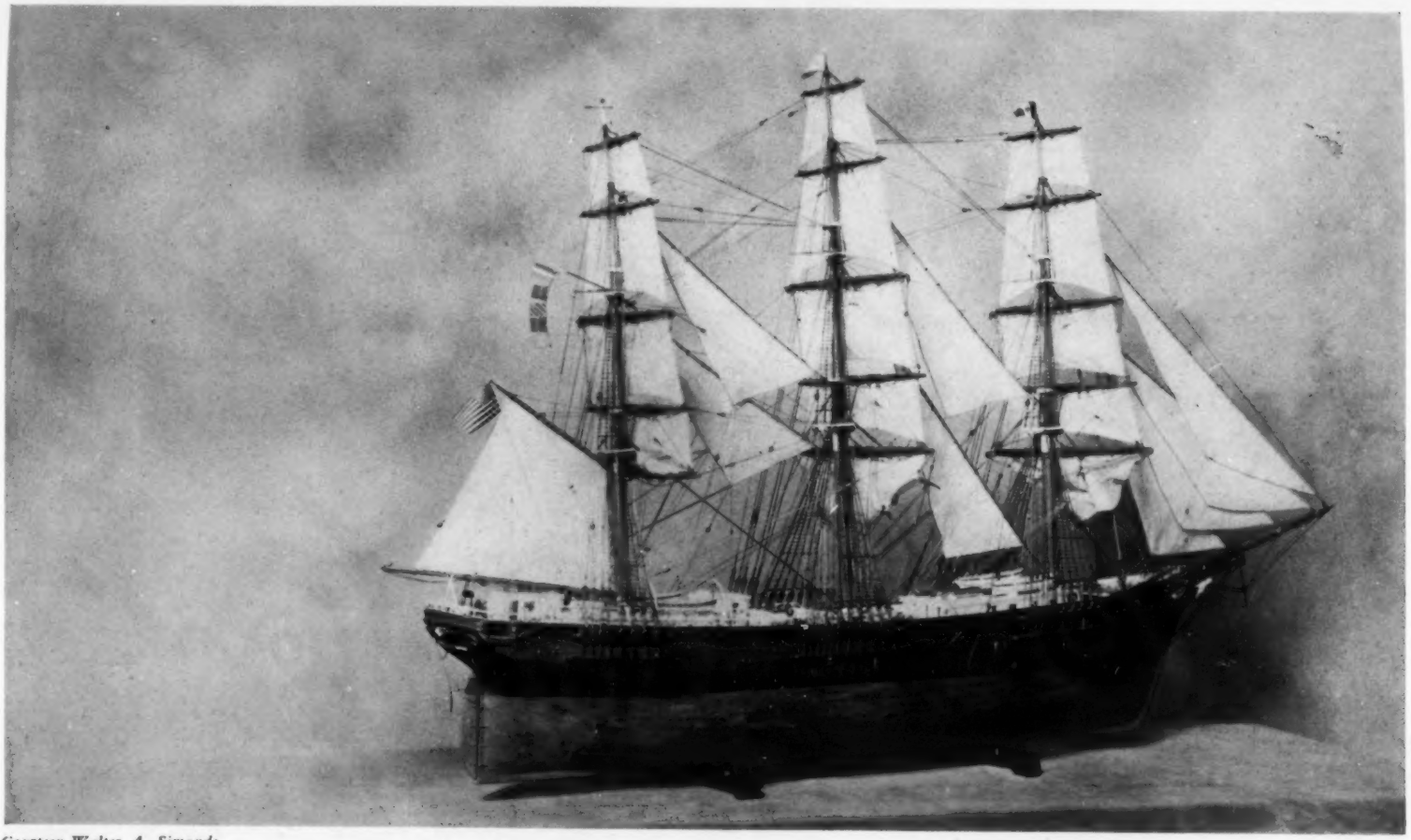
THE GOAL AT THE END OF 15,770 MILES

Crew of the *Oregon* view from the forecastle the wreck of the *Colon*. U.S.S. *Brooklyn* is standing by at the conclusion of the battle of Santiago.

Courtesy Lieutenant Commander H. A. Gosnell, U. S. Naval Reserve

THE GOAL AT THE END OF 15,770 MILES

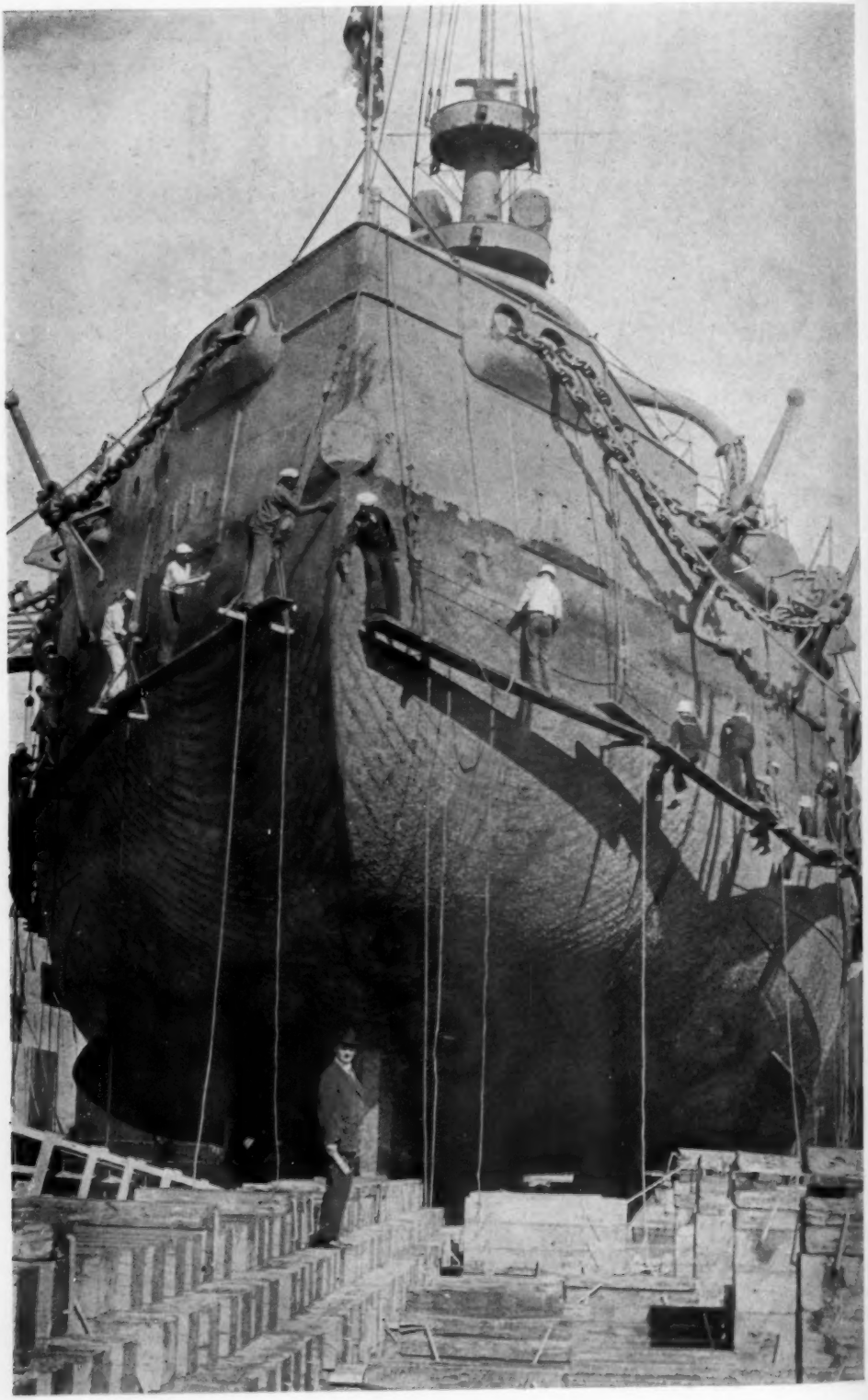
Crew of the *Oregon* view from the forecastle the wreck of the *Colon*. U.S.S. *Brooklyn* is standing by at the conclusion of the battle of Santiago.



Courtesy Walter A. Simonds

MODEL OF THE *B. SEWALL*, BUILT AT BRUNSWICK, MAINE, IN 1874 AND LOST IN THE CHINA SEA IN 1903

The *B. Sewall* delivered coal to the *Oregon*.



U.S.S. *OREGON* IN DRY DOCK, NAVY YARD, MARE ISLAND, CALIFORNIA, 1915

COMMUNICATION ORGANIZATION

By John Robert Johnson, C.R.M., U. S. Naval Reserve

THE Navy has two "weapons" that are very closely allied: communications and transportation. In communications the radio service is the most important, as well as the most rapid. In transportation, the air service is most rapid. In the future, radio and aviation will inevitably be much more closely associated.

The Naval Communication Service is an organization within an organization. This is necessary because of the highly specialized nature of the work. In communications, we must provide an organization of specialists who are able to produce the results required by the Navy. Radio communication, like all highly specialized work, needs a technical head. This head has functions of its own within the service, but the function of government of the service is performed by the Navy.

The personnel of the service have two duties, the military and the specialist's. There is a point where the details of communications are necessarily left to the specialist and also a point where the authority of the specialist ends. It is not the object of this article to attempt the definition of this point. An understanding in that respect will ultimately be reached. The problem considered herein is the technical organization of the Communication Service in such manner that the line officer may have at his command a smoothly functioning machine. When the machine breaks down, the services of the specialist are necessary. When it is working normally, it is available as one of the "weapons" of the Navy.

The organization plan that follows is presented after a close study of the methods of the leading telephone, telegraph, and radio companies of the United States. It embodies some features of each and represents opinions gradually formed in sixteen years' continuous experience with communication problems. It may be well to note at this point that the plan given is concerned solely with the radio branch of naval communications and is presented from the specialist's point of view.

The mission of communications is the transmission and receipt of orders and information between the commanders of various units and the commander in chief. In order to accomplish this properly, the service must be accurate, rapid, and secret.

Thus the three essentials of the service are speed, accuracy, and secrecy. If any one were given precedence over the others, it would be accuracy, as speed and secrecy are both dependent on it. Accuracy is the key to speed, and cannot be overstressed.

Fundamentals

A few fundamentals are quoted for ready reference.

First, the length and character of the instruction course determine the quality and efficiency of the service.

Second, the duties of each man in the service should be clearly defined.

Third, departments should not overlap.

Fourth, duplication of work is an economic loss and should not be permitted.

Fifth, practice that is useless in time of war is detrimental and should not be permitted at any time.

Sixth, no rule, regulation, duty, or method should be promulgated that will not apply in every part of the organization.

Seventh, all personnel responsible for the efficiency of the service should be in the service and subject to its rules and regulations.

These fundamentals are axiomatic and should be referred to whenever a statement occurs herein that is so much at variance with apparent custom as to occasion surprise.

Instruction

The organization provides for three main operating departments and one instruction branch. The instruction branch will be

considered first because it is not—properly speaking—a department of the service, although a necessary adjunct.

The instruction branch sets the standard for the service. (See Fundamental Number One). The details of organization for the instruction branch are not given here on account of space limitations. However, a few general rules are given in order to make the working of the organization more clear.

(1) One school only should be maintained. This will ensure uniform instruction and is by far the most economical method. Attempts to standardize methods, while utilizing more than one school for instruction purposes, usually fail.

(2) The officer in charge of the instruction branch should be an assistant to the director of the service.

(3) The length of the course of instruction may vary according to the standard set for the service. For the purposes of this plan, the length of the course is set at three years. If the course of instruction is brief —say six months—the number of subjects taught must of necessity be curtailed and the standard of the service will be correspondingly low. Much depends on the length of instruction.

(4) The best age for students to begin instruction is about fifteen years. If this appears too young, remember that most of the best operators started in radio before they were ten. The younger the better.

(5) Students should agree to remain in the service for at least four years after completion of instruction. (This is a total of eight years, as the instruction continues for one year after leaving the school).

(6) Subjects taught should include the usual high-school subjects in addition to elementary radio engineering, telephony, telegraphy, stenography, traffic management, filing systems, and bookkeeping; with postgraduate courses in radio engineering, strategy and tactics, cryptanalysis, and aërial observation. Certain of the postgraduate courses could be handled by the correspondence method.

(7) A digression is necessary at this point to bring out the aviation aspect in its relation to radio. Most authorities are aware of the close parallel that exists between the mission of aviation and radio communication in the Navy. These points are frequently lost sight of, however, in the attempts to coördinate these two branches of naval activities. A few of these points are reviewed in order to explain why it might be well to train men for the communication and air services at one school.

(a) All aviators are required to be able to send and receive messages by radio.

(b) Both aviation and radio are essentially proponents of speed in the gathering and reporting of information.

(c) The aërial observer who obtains valuable information concerning the enemy must be able to report it or it is valueless. Pigeons cannot compete with radio in speed, but have their use during radio silence.

(d) By closer coöperation between radio and aviation, torpedo planes controlled by radio can be perfected.

(e) Radio, to be of any real assistance to aviation, must be more closely allied with it. The aviators must be better operators and the operators must have more than a mere working idea of aviation.

From the above it will be seen that definite improvements should result by training aviators and wireless men together, by a course of instruction long enough to raise the standards of the service.

ORGANIZATION

The radio branch is, as a whole, divided into three departments. These three departments exist at present, but are not officially recognized. They are the Traffic, Record, and Plant Departments. They are determined by the three different kinds of work and the types of men best fitted for their performance. The Traffic Department handles messages by radio and wire, furnishes observer operators for spotting, etc. The Record Department handles the office work, files, requisitions, reports, codes and decodes messages, abstracts commercial traffic if handled (it should not be handled—see Fundamental Number Five), provides and is responsible for the secrecy of codes and ciphers, and handles the local delivery and filing of messages for transmission. The Plant Department handles research, design, manufacture, installation, maintenance, testing, and adjusting of all apparatus manned by radio personnel.

One requirement in common is demanded of every man in the service, regardless of which department he is in. Each must be

able to transmit and receive messages by radio and wire. In cases of emergency anyone may be called on to assist the Traffic Department. To this end no one should be taken into the service except through the service school.

The emergency referred to above should be a real emergency and men from other departments should only be so detailed until additional Traffic Department personnel is available. The only exception to this rule is on small vessels where men of all three departments must stand traffic watches.

Traffic Department

The scope of this department is the handling of messages by radio and wire and the furnishing of operators to act as observers and spotters with the air service.

Personnel.—Each man that enters the Traffic Department has completed a three-year course of training in the instruction branch. This three years counts towards his retirement. He leaves the school as a student operator.

Organization.—(1) Student operator, one year; (2) junior operator, five years; (3) senior operator, five years; (4) supervisor, four years; (5) chief operator, two years (twenty-year retirement optional); (6) traffic inspector, five years (twenty-five-year retirement optional); (7) traffic chief, five years (thirty-year retirement optional).

Duties.—(1) Student operators, upon assignment to the Traffic Department, are expected to serve one year in this capacity. This year is used in rounding off their education with first-hand knowledge of how the Traffic Department functions and in performing the duties of junior operators when so directed by the supervisor. After the completion of one year as student operator, they automatically become junior operators without examination.

Note: The elimination of examinations may seem a radical departure, but the writer's experience has shown that written examinations are generaly very misleading. Men who are absolutely incompetent will "cram" for an examination, pass it, be promoted, and then fall down on every occasion that requires judgment and a good general knowledge of the situation. Information crammed in a short time, for the sole purpose of passing an examination, is very quickly forgotten. Some men have the faculty of expressing meager knowledge well and pass examinations with higher marks than men who are actually better informed but who are poor at expressing themselves. When no examinations are given, the conduct of each man and manner of performing his duties are more closely watched by his immediate superiors. A man who is patently not making good will be given a chance to improve. If improvement does not take place within a reasonable length of time, he will be dismissed from the service. After all is said and done, it is a man's ability to make good and not his ability to pass examinations that really determines his fitness. Men who pass examinations with high marks are not as a rule so closely watched; while if no examinations are held, the man in the next higher position is always on the lookout to see how the recently promoted man is making good. The most efficient communication organizations base their promotions on the length of service and demonstrated ability. No examinations are held.

(2) Junior operators must be expert in both Morse and Continental; must know something of military tactics and the naval organization both afloat and ashore. After three years as junior operator they are eligible for transfer to either the Plant or Record Department. At this time, seven years after entering the service, they should have progressed sufficiently to show which branch or department they are best fitted for. We will follow the case of a junior operator who concludes to remain in the Traffic Department. This man serves two more years as junior operator, a total of five years in this rating, after which he is automatically advanced to the rating of senior operator.

(3) The duties of senior operators are much the same as junior operators, except that they are expected to be more efficient and use better judgment. They are required to be proficient in any special telegraphic code that may be developed by the service. They are also required to be able to handle messages in all foreign radio-telegraph codes. This is necessary to effect the breaking of enemy ciphers.

After the completion of five years as senior operator the man is advanced to the rating of supervisor. If no vacancy exists in the ranks of supervisors, he remains on

his previous duties but advances to the supervisor's rating.

(4) Supervisors must understand traffic dispatching, routing of messages, the management of men, and the running of the watch. The supervisor is in charge of the watch in the Traffic Department only. He details the operators on the various circuits and is responsible for the handling of traffic in his watch with all possible accuracy and speed. After four years as supervisor, he is automatically advanced to chief operator.

(5) The chief operator is in charge of the local Traffic Department of the communication unit (the radio station) to which he is assigned. He is the local representative of the head of the Traffic Department and is responsible to him directly for the efficient conduct of the local Traffic Department. After two years chief operators have the option of retiring (twenty-year retirement) or advancing to traffic inspector, provided a vacancy exists in that rank. If no vacancy exists they retire automatically. No man remains in any position for a longer or shorter term than the organization calls for.

(6) The headquarters of traffic inspectors are in the office of the traffic chief. However, most of their time is spent in traveling from one station to another. The duties consist of inspecting the offices of the Traffic Department. They must know the Traffic Department thoroughly and must be able to detect any procedure or method that diverges from the standard of the organization. They do not inspect at stated intervals, but only when directed to do so by the traffic chief. No notice of their coming is given. Traffic inspectors after five years have the option of twenty-five-year retirement or if a vacancy exists are appointed to the position of traffic chief.

(7) The traffic chief is the head of the Traffic Department. He is responsible to the director for the conduct of this department. He directs the traffic inspectors in their tours of inspection. He encourages initiative among the members of his department and collects and passes on recommendations from them for improvement. He sees that new methods are put into effect at all Traffic Department offices simultaneously, utilizing the traffic inspectors for this purpose. They visit the different units and inaugurate the change. It is not within the scope of duties of the traffic chief to visit stations and make inspections, although he may do so in special cases if he thinks the conditions warrant.

Promotion above Traffic Department.—After five years the traffic chief is eligible for thirty-year retirement or promotion to assistant director of communications. The assistants to the director vary in number with the requirements of the service. The length of service as assistant director varies somewhat, as it depends on the retirement of the director. The director holds his position for two years. Upon his retirement the senior assistant becomes director.

General traffic rules.—The following may serve as a basis for formulating rules for the Traffic Department.

(1) No message should ever be sent in plain language (see Fundamental Number Five) except distress and emergency messages. By adhering to this rule, a really efficient war-time organization can be built up.

(2) Only one form should be used for transmitting messages, this form to be as simple as possible.

(3) Only one kind of message blanks. These should have space for approximately one hundred code words.

Traffic Department equipment and layout.—Diagram A illustrates the layout of the Traffic Department. Note that each position is a duplex position, with the receiving side on the left. These duplex positions are separated by a row of partitions. These partitions may be of wood or metal below the table top and safety glass above. Each position is marked with the name of the circuit and habitually used for that circuit. Two hand telegraph keys, two loud speakers, two head-phone jacks and head phones, one line pilot lamp, one typewriter, two chairs, a supply of message blanks, one automatic time stamp controlled by a clock, and one numbering machine are furnished for each duplex position. The conveyor belts are installed at stations where the number of positions and volume of traffic warrant. The conveyor belt runs down the line of positions just above the operating table about level with the top of the typewriter. One end of the conveyor belt terminates in the Record Department at the junior recorder's desk and the other end at the last position. There

should be no doorway connecting the Record Department with the Traffic Department. This is of more importance than may be readily apparent. Communication between the recorder and the supervisor may be either by telephone or voice tube through the glass partition. The chief operator's desk should be located near the traffic room but separated from it by a glass and wood partition. The chief operator does not require a stenographer or office force as he handles no official mail. When matters do not run smoothly, he sends a message requesting the presence of a traffic inspector. The chief operator marks the records of all the men in the Traffic Department every month. These records are kept on file in the Record Department. Generally the thing for the chief operator to avoid is the issuance of too many orders. Complicated instructions slow down communications and their avoidance is absolutely essential if communications are to be kept secret, accurate, and speedy. There will be ample room for complicated instructions in the organization of the Plant Department. The essence of the Traffic Department is simplicity.

Record Department

Scope.—(1) Maintains all files and handles reports for all three departments.

(2) Accepts all traffic for transmission and handles local deliveries.

(3) Receives, issues, and is responsible for codes and ciphers.

(4) Takes care of all office work of the station.

Personnel.—Junior operators who show inclination and talent for record work are transferred to this department upon completion of three years as junior operators. They enter the Record Department as junior recorders. The men best suited for record work are ambiverts or introverts.

Organization.—(1) Junior recorder, two years; (2) senior recorder, five years; (3) cryptographer, four years; (4) chief cryptographer, two years (twenty-year retirement optional); (5) record inspector, five years (twenty-five-year retirement optional); (6) record chief, five years (thirty-year retirement optional).

Duties and Requirements.—(1) The junior recorder stands watch in the Record Office. He keeps the message files, prepares all daily reports, accepts traffic for transmission and handles local deliveries. After two years he is made a senior recorder.

The senior recorder stands watch with the junior, at stations large enough to require two men on duty at once. He codes and decodes messages, plots course of vessels during tracking and attempts the breaking of enemy codes. He must be a stenographer.

Note: As many junior and senior recorders as may be necessary to handle the volume of traffic are on duty together. The senior recorder on duty is in charge of the record watch.

After five years the senior recorder becomes a cryptographer.

(2) The cryptographer has charge of codes and ciphers, handles office work, prepares special, monthly, quarterly, semi-annual, and annual reports, for all three departments. After four years he is advanced to the rating of chief cryptographer, but if no vacancy exists, performs the same duties as before.

(3) The chief cryptographer has charge of the local office of the Record Department. He forwards all written reports to the record chief; marks the records of men in the Record Department once per month; is responsible to the record chief for all codes and ciphers; must be expert in cryptanalysis. After two years' service he retires with twenty years' service, or if a vacancy exists, he is given the rank of record inspector.

(4) The record inspector's duties are the same (in the Record Department) as the duties of the traffic inspector in the Traffic Department. In addition, the record inspector distributes secret publications that may not be trusted to the mails. Record inspectors must be active in the preparation of such new codes as may be developed by men in the Record Department. After five years record inspectors have the option of retiring, or if a vacancy exists, advancing to record chief.

(5) The record chief is the head of the Record Department. Duties correspond (in the Record Department) to those of the traffic chief in the Traffic Department.

General rules for the Record Department.—All traffic accepted for transmission is coded by the recorder on duty, written up on the prescribed forms, recorded, and turned over to the Traffic Department. The

file number is the first group in each message and is never coded. This file number is obtained by combining the date and time of filing for transmission. Thus, if the number is 030005, it indicates that the message was originated on the third day of the current month at 12:05 A.M. The first two numbers represent the date and the last four the time. After the message has been transmitted, it is returned to the Record Department, logged, and filed under the 0000 tab. This detail is given because it has proved a very efficient method of filing messages. The coded copy is kept in the open files, while the paraphrased English copies are filed in the vault.

No office reference number is provided for, as the office of origin is shown in the preamble of the message. Each office or officer who has authority to originate messages is provided with a combination of letters, or numerals, or both, to be used as an address.

Messages concerning matters that could be handled expeditiously by mail should not be accepted for transmission. All messages (with one exception) are to be considered *rush*. If they were not, the matter would have been attended to by mail.

Messages take precedence according to time of receipt for transmission. "First come, first served." The exception is marked "P," which indicates that the message is an enemy contact report or information concerning the enemy, which is of the same importance. If the "P" is followed by two numerals, it is an indication that the message is valueless unless delivered by the time specified. For instance, the prefix of "P35" would indicate that if the message is not delivered to the addressee inside of thirty-five minutes, it should be canceled and the office of origin notified of the fact.

Night messages are not considered *rush* and must be delivered not later than 9:00 A.M. of the day following origin, although usually delivered earlier.

The penalty for misuse of "P," whether followed by the numerals or not, should be severe, as a great tendency exists to use this indication of priority unnecessarily, thus decreasing its value.

Whatever form the final arrangement of regulations takes, the main point is to provide uniform methods throughout the service.

PLANT DEPARTMENT

Scope.—Research and design, manufacture and installation, testing, calibration, and operation of all apparatus used in the transmission and reception of messages.

Personnel.—Obtained from the Traffic Department in the same manner as Record Department personnel. Men of the type described as introverts are best for the Plant Department.

Organization.—(1) Plant operator, two years; (2) installation assistant, five years; (3) research assistant, four years; (4) installation chief, two years (twenty-year retirement optional); (5) plant inspector, five years (twenty-five-year retirement optional; (6) plant chief, five years (thirty-year retirement optional).

Duties and requirements.—The plant operator stands watch in the Plant Department. If stationed at a receiving plant, he tunes receivers and maintains communication on all channels. If at a transmitting plant, starts and stops transmitters, adjusts relays, etc.

Installation assistant, same as plant operator; in addition must be capable of neat, standard installation work under direction of installation chief. Must understand the maintenance of batteries, receivers, transmitters, time clocks, time stamps, numbering machines, conveyor equipment, typewriters, electric business machines (if used), motors and generators.

Research assistant, same as installation assistant, but more advanced work; must be able to design improved types of equipment for the service, under the direction of the installation chief.

Installation chief, in charge of local Plant Department. He supervises research, takes charge of new installation work, and marks records of men in Plant Department once a month. After two years, he has option of twenty-year retirement, or advancing to plant inspector, provided a vacancy exists.

The plant inspector's duties the same (in Plant Department) as other department inspectors. In addition, he must be alert for any possible improvements that may be made in the plant. After five years he has the option of twenty-five-year retirement or advancement to plant chief.

The plant chief is in charge of Plant Department, the most advanced technical position in the service.

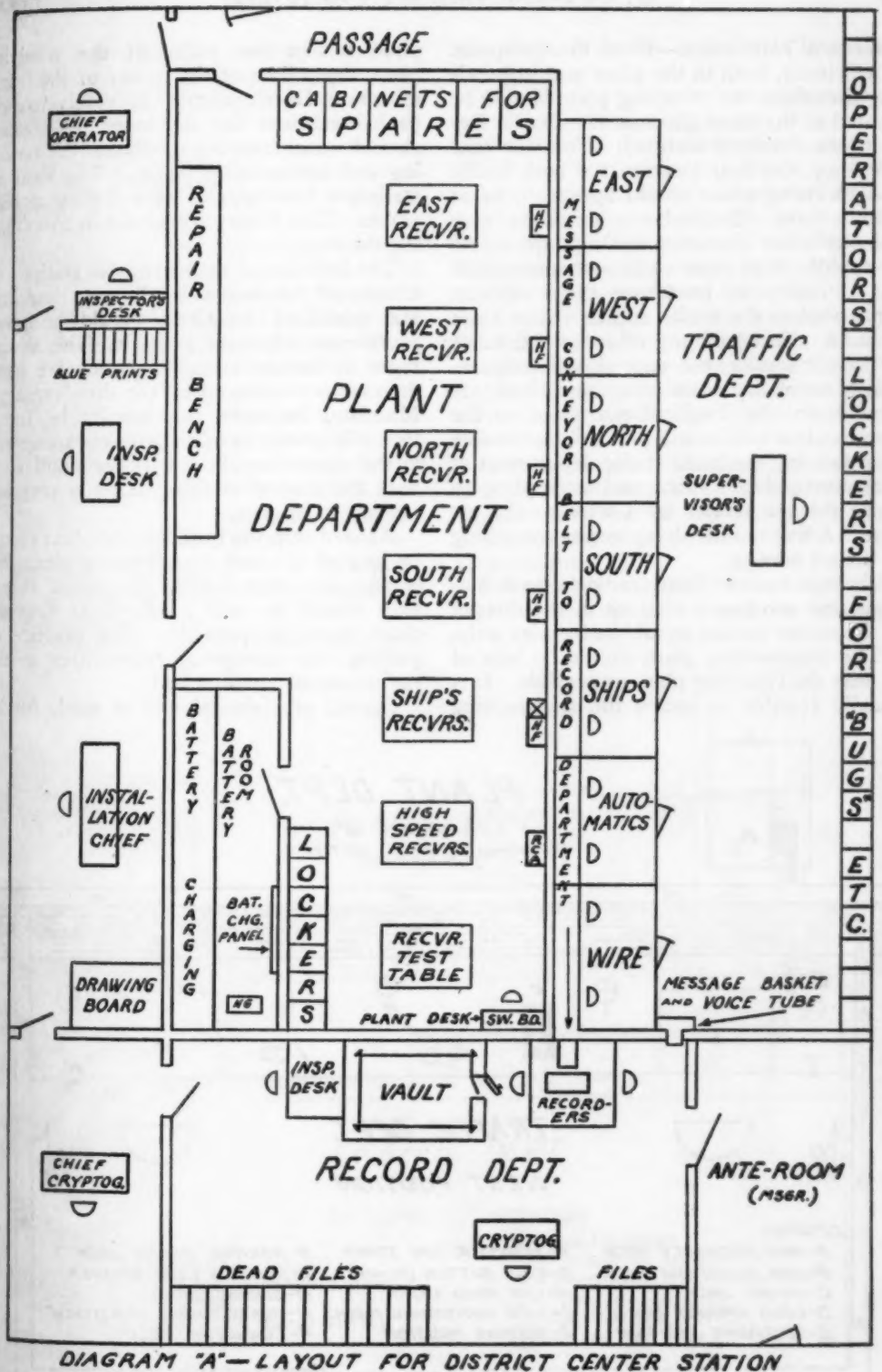


DIAGRAM "A"—LAYOUT FOR DISTRICT CENTER STATION

General plant rules.—From the viewpoint of efficiency, both in the plant and in handling messages, the receiving plant should be located at the same place as the Traffic Department (control station). For war-time efficiency, the best location for both traffic and receiving plant would appear to be at the air base. Tactical considerations may point to other locations, but airships travel so rapidly that even radio communication has difficulty in rendering them efficient service when the traffic station is not close at hand. To be of any effective assistance to the air service, the very closest coöperation is necessary from communications. A wire from the Traffic Department to the commandant's office will prove more feasible than locating the main traffic department at the commandant's office and attempting to serve the air service by a wire to the air base. A five-minute delay means something to the air service.

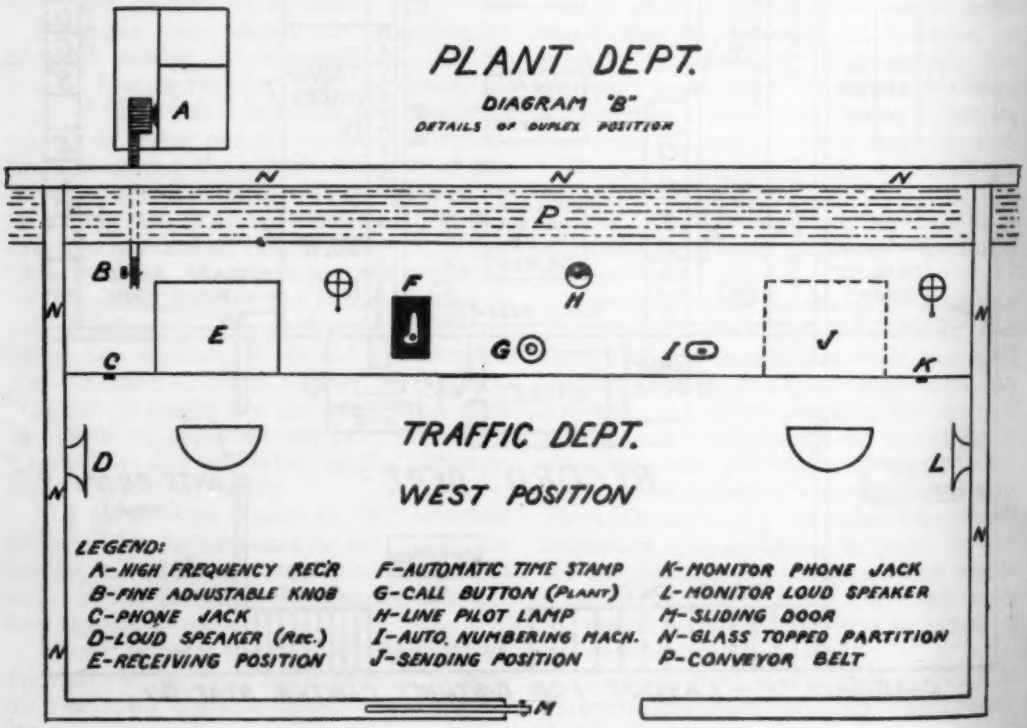
Communication from radiocompass stations and secondary stations in the district to the center station should be by wire only.

The transmitting plant should be located as near the receiving plant as possible. It is usually feasible to locate the transmitting plant within two miles of the receiving plant, regardless of the power of the transmitters. Developments in receivers will probably lessen this distance. In no case should water intervene between the receiving and transmitting plants. The local installation chief should have charge of both plants. This is very important in coördinating the two.

The location of radiocompass stations on islands off the coast is hardly ever necessary and mainland locations should be given preference wherever possible. The advantages of certain island locations are more than counterbalanced by the disadvantages. Mainland locations can usually be found that will permit excellent cross bearings and at the same time allow wire communication with the control station. This is very important in tracking.

Aboard ship the transmitting plant should be located aft and the receiving plant forward. Direction-finding equipment aboard ship should be well forward, as near the chart house as possible. The practice of putting the emergency transmitter in the radiocompass room is bad.

Special provision should be made for an



operator at the fire-control station to facilitate communication with spotting planes.

At the center stations, the switchboard controlling all wires for communication with the various compass stations, secondary stations, and transmitting plant should be located in the receiving plant. The plant operator acts as the wire chief.

Operation.—At radio central or district center stations, the amount of traffic handled and service required will make the layout of equipment and method of operation identical, the only difference being in the number of duplex positions installed.

The sequence of operations at such stations is made clear by referring to the diagrams. Following is the sequence of operations when a message is received by the operator at the east receiving position:

(1) East receiving operator copies message.

(2) He stamps TOR on it with automatic time stamp and throws message on conveyor belt.

(3) Message arrives at recorder's desk and drops in junior recorder's "incoming" basket.

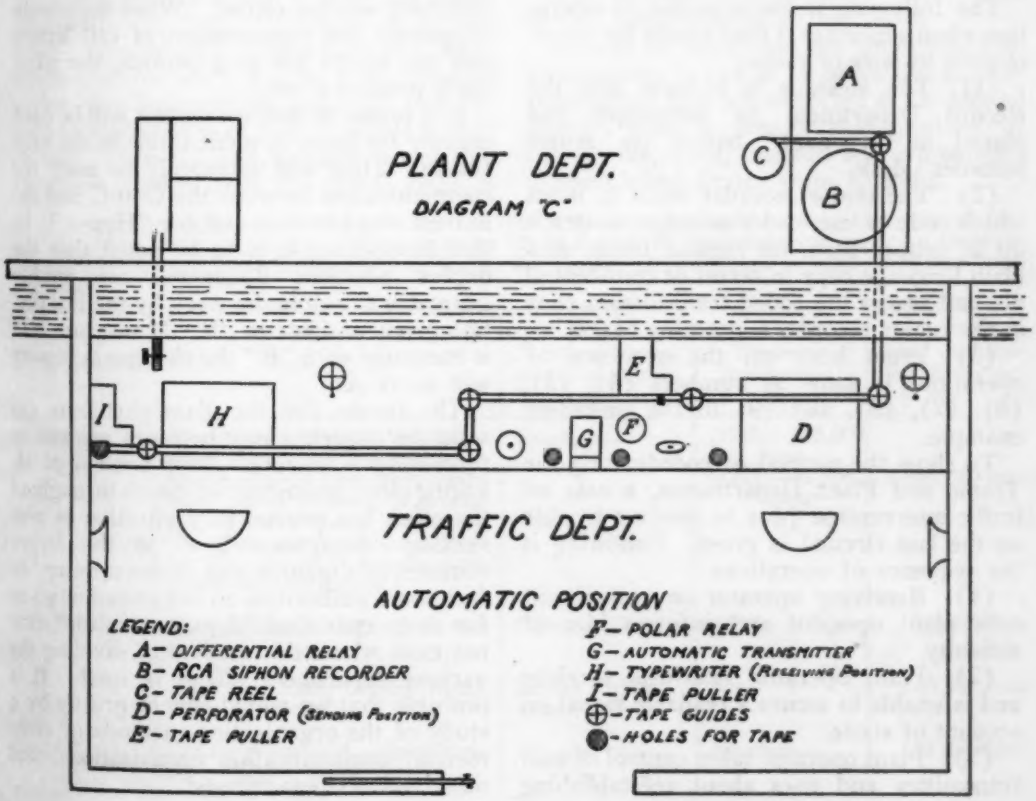
(4) Junior recorder puts message in typewriter, decodes origin and address and writes them on the message blank, observes that it is a "local delivery," logs it, and puts it in the senior recorder's "incoming" basket.

(5) Senior recorder decodes message, writes it up (paraphrased) for local delivery, calls messenger, and puts the delivery copy in the local delivery basket.

(6) Messenger takes message from local delivery basket and delivers it, while senior recorder files code copy in live file, decoded copy in secret or confidential file, according to the code or cipher it was received in.

It is to be noted that the same sequence of operations would obtain regardless of whether the message was received by wire or any of the other positions in the Traffic Department.

Following is the sequence of operations when a message is received for relay (by wire or radio):



Operations (1), (2), and (3) are the same as in the preceding example.

(4) Junior recorder puts message in typewriter, decodes origin and address, observes that it is a relay, logs it, and puts it through the slot in the partition, where it drops into the supervisor's message basket.

(5) Supervisor receives message from student operator, observes address, types proper heading for relay, designates circuit it is to go on, and has message delivered to that circuit by student operator.

(6) Student operator places message on the bottom of the file of messages awaiting transmission, unless the message is marked "P."

(7) Transmitting operator stamps number on message with automatic numbering machine, sends the message, stamps TOD on it with time stamp, and throws message on conveyor belt.

(8) Message arrives at junior recorder's desk again. He completes logging it and places it on senior recorder's incoming basket.

(9) Senior recorder files it.

The following is the sequence of operation when a message is filed locally for transmission by wire or radio:

(1) The message is brought into the Rĕcord Department by messenger and placed in "incoming" basket on senior recorder's desk.

(2) The senior recorder reads it, notes which code to use, codes message, writes it up in proper form on regular blank, files plain language copy in secret or confidential file and places the coded transmission copy in the junior recorder's incoming basket.

(3) From here on, the sequence of operations is same as numbers (4), (5), (6), (7), (8), and (9) in the preceding example.

To show the method of coördinating the Traffic and Plant Departments, a case of traffic interruption (due to receiver trouble on the last circuit) is given. Following is the sequence of operations:

(1) Receiving operator on east circuit calls plant operator and informs him of difficulty.

(2) Plant operator readjusts receiver and is unable to secure a readable signal on account of static.

(3) Plant operator takes control of east transmitter and goes about reëstablishing communication in much the same manner as a wire chief setting up a circuit when a wire is open. He has the eastern station test on his other available transmitters, if it becomes evident that the static has rendered the first one unreadable. The other receivers on the east table are listened to and signals compared, until a readable signal is obtained on one of them. When reliable communication is again available, the receiver is again plugged in on the east traffic position and control of the east transmitter restored to the east operator. In case communication is not established within a reasonable length of time, the plant operator informs the supervisor of the interrupted circuit.

(4) The supervisor routes traffic via other circuits if possible.

(5) The plant operator calls the installation chief on the phone and reports.

(6) The installation chief must take such steps as may be necessary to reëstablish the circuit.

Tests are usually conducted for the purpose of determining the advisability of establishing another circuit. When these tests necessitate the transmission of call letters and test letters for long periods, the automatic position is used.

It is probable that automatics will be used entirely for point-to-point traffic in the near future. They will ultimately be used for communication between the C-in-C and the nearest shore station and for "Hypos." In this connection, it is to be noted that the duplex positions illustrated are readily adaptable to automatic work by the installation given in diagram "B." If diagram "C" is compared with "B," the changes necessary will be evident.

The reason for the glass partitions (to separate departments) becomes evident in promoting teamwork. This method of allowing clear, unobstructed vision throughout the office has proved very effective in preventing "departmentalitis" in the larger commercial organizations of the country. In fact some authorities on organization go so far as to state that "departmentalitis" cannot exist where this method of dividing the various department offices is used. It is probable that we would benefit greatly by a study of the organization methods of commercial communication organizations, and other business enterprises.

AMERICAN FOREIGN TRADE AND THE AMERICAN MERCHANT MARINE

By Commander F. J. Cleary, U. S. Navy

With a definite tonnage limitation established for all classes of naval ships by the terms of the London Naval Treaty of 1930, the national merchant marine assumes a still greater relative importance.

One of the three important elements that comprise sea power is:

A national merchant marine adequate in number and types of ships, and in national personnel, to carry on the nation's trade and to supplement and to supply the Navy in time of war.

There is an unfortunate, widespread impression in the United States that we could carry on a successful war without sea-borne commerce. In fact, many men of prominence, very much in the public eye, have stated that we are the most self-contained nation that has ever existed, and that we need no importation of raw materials in case of war. How far this impression and this statement depart from the actual facts is shown by the accompanying list of raw materials, practically all of which are absolutely essential in time of war, and for which the United States depends largely or entirely on importation in merchant ships, and of which there are little or no reserve stocks carried in this country. The destruction of our sea-borne commerce would, therefore, deprive the manufacturing establishments in this country of the raw materials necessary to produce the finished products required for a successful naval and military campaign, and an enemy that had secured the command of the sea could destroy our sea-borne commerce without approaching nearer than several hundred miles to our coasts.

It is to be noted that the producing foreign country is not in all cases the country from which they are exported to the United States; thus a considerable portion of rubber, tea, wool, tin, and silk are shipped to the United States from England.

Partial List of Important Raw Materials Which Are not Produced in This Country, or are not Produced Here in Quantity Sufficient to Meet Domestic Requirements, with an Official Estimate of the Quantity Importation of Each that Would be Necessary During the First Year of a War.

Material	Principal use	Principal foreign source of supply	Domestic production	Estimated required importations first year of war.
Manganese (high-grade)	Manufacture of steel. Very high-grade manganese ore required in manufacture of high-grade steels, for ordnance material, for aircraft material, etc. (Large deposits of low-grade manganese ore in U. S. but deposits of high-grade manganese ore very limited.)	Brazil, India	(1918)—305,000 tons (1923)—32,000 tons	1,200,000 tons
Tungsten	Manufacture of high-speed tool steel	China, India	(1923)—250 tons	12,000 tons
Tin	Food containers, bearing metal, solder, bronzes	Straits Settlements, Bolivia	None	100,000 tons
Nickel	Ordnance material, engine forgings, shafting, monel metal	Canada	Nominal	25,000 tons

PARTIAL LIST OF IMPORTANT RAW MATERIALS WHICH ARE NOT PRODUCED IN THIS COUNTRY, OR ARE NOT PRODUCED HERE IN QUANTITY SUFFICIENT TO MEET DOMESTIC REQUIREMENTS, WITH AN OFFICIAL ESTIMATE OF THE QUANTITY IMPORTATION OF EACH THAT WOULD BE NECESSARY DURING THE FIRST YEAR OF A WAR.

Material	Principal use	Principal foreign source of supply	Domestic production	Estimated required importation first year of war
Graphite	Lubricants, crucibles	India, Mexico, Madagascar	5,000 to 15,000 tons	35,000 tons
Sodium nitrate	Explosives, fertilizers	Chile,	Depends principally on possible production of fixation plants	1,500,000 tons
Rubber	Automobile tires, mechanical rubber goods, boots, shoes, insulating materials, gas masks, hospital supplies	Straits Settlements, British and Dutch East Indies, India, Burma, Brazil	None	500,000 tons
Cork	Life preservers, heat insulating materials	Portugal, Spain	None	120,000 tons
Iodine	Medicinal use	Chile,	Practically none	700 tons
Manila, Sisal, Hemp, etc.	Cordage and twine	Philippines, Mexico	None	300,000 tons
Jute	Burlap and gunny sacking	India	None	500,000 tons
Wool (raw)	Clothing, blankets, etc.	Australia, Argentina, China	140,000 tons	300,000 tons
Silk	Clothing, powder bags, parachutes	Japan, China	None	35,000 tons
Shellac	Varnish, electrical apparatus	India	None	20,000 tons
Chinchona bark and Quinine	Medicinal use	East Indies	None	7,000,000 oz.
Cocoa	Food	British W. Africa, Brazil, Ecuador	None	300,000 tons
Tea	Food	China, Japan, Ceylon	Nominal	80,000 tons
Sugar	Food	Cuba, Hawaii, Philippines, Porto Rico	1,000,000 tons	6,000,000 tons
Coffee	Food	Brazil, Columbia, Venezuela	None	900,000 tons

While a complete lack of knowledge relative to our foreign trade and the important relation of the merchant marine to that trade is not so widespread as it was a few years ago, still there are a great number of people in the United States who have no real conception of this vital subject.

It, therefore, becomes the duty of naval officers to make themselves thoroughly familiar with this subject, to grasp every opportunity to inform their acquaintances in civil life with the facts relating thereto and to impress upon them the vital necessity of an adequate American merchant marine.

For the years 1927, 1928, and 1929, the tonnage and value of our foreign world trade were as shown in the table on the next page.

	1927	*1928*	*1929*
Imports, tons	42,183,000	47,395,000	50,985,000
Imports, value	$3,661,394,000	$3,550,231,000	$3,807,025,000
Exports, tons	56,935,000	58,829,000	57,475,000
Exports, value	$4,049,882,000	$4,230,211,000	$4,284,218,000
Total, tons	99,118,000	106,224,000	108,460,000
Total, value	$7,711,276,000	$7,780,442,000	$8,091,243,000

approximately 55 per cent of which was export of manufactured articles, raw materials, and foodstuffs.

This stupendous volume of trade was carried as follows:

American vessels, tonnage	42 per cent	42 per cent	40 per cent
Foreign vessels, tonnage	58 per cent	58 per cent	60 per cent
American vessels, value	$2,634,794,000	$2,592,511,000	$2,680,979,000
Foreign vessels, value	$5,076,482,000	$5,187,931,000	$5,410,264,000

The Department of Commerce, after a careful survey, has estimated that one out of every six of our citizens who are gainfully employed, depends for his living on our foreign export trade, so that the complete loss of our foreign markets would directly create an unemployed list of about 2,900,000 citizens and the ramifications and the loss of business which would result from the loss of income of these nearly three million people would be widespread. This is an average of 60,000 for each state and, of course, there is a greater number of citizens employed in foreign export trade in a manufacturing state such as New York or Pennsylvania than there is in a state in which manufacturing is not such a primary interest.

To successfully compete with other nations in the markets of the world, we need a merchant marine owned and operated by Americans. If anyone believes that we can depend upon a foreign merchant marine to serve our maritime and commercial interests properly, he is believing in an utter fallacy. In such case, the merchants and manufacturers of the United States with their carriers owned and operated by their foreign competitors, would be in precisely the same status as the Standard Oil Company of New York would be if it depended upon the shipment of its products on ships and railways owned and operated by the Royal Dutch-Shell Oil Company, or would be in the same status as Wanamaker's of New York if it depended upon the receipt of its shipments and the delivery of its merchandise to its customers in New York and vicinity on delivery trucks owned and operated by Macy and Company, or by Bloomingdale Brothers.

The merchant marine of the United States engaged in foreign trade in competition with foreign merchant marines is seriously handicapped in many ways. First by the fact that, with the exception of merchant ships captured in time of war, it is not possible to obtain American registry for a merchant ship unless that ship was built in an American shipyard, and it is quite right and proper that such should be the case. But, owing to the higher cost of materials and the higher wages paid American shipyard mechanics, it costs more to build a ship in an American shipyard than it would cost to build that same ship in a foreign shipyard. Added to this higher initial cost, and as a direct resultant therefrom, there is the increased depreciation figure and increased interest on the investment, both of which must be charged as part of the operating cost. Then, too, there is the question of repairs. Foreign ships generally have their repairs made in the cheapest market. For instance, the ships owned by the Canadian Pacific Railroad and British ships sailing to far eastern waters have their repairs made in Chinese shipyards where the cost of labor is very small compared to the cost of labor in British shipyards, Canadian shipyards, or shipyards in the United States. If an American ship has its repairs made or its equipment replaced in

a foreign shipyard, unless those repairs or equipment are necessary for the safety of the ship, its crew or passengers, our government charges the American shipowner or operator a tax of 50 per cent of the repairs made or the equipment replaced in the foreign shipyard. There is the further handicap due to such legislation as the LaFollette Act, which requires American ship operators to employ larger crews, to pay them higher wages, and to provide more expensive accommodations and better food than is the case with foreign ships. Consequently, to enable American ships engaged in foreign trade to compete on an even basis with foreign ships, some sort of government aid seems to be necessary. Such aid is usually referred to as a "ship subsidy."

Every maritime nation, except the United States, has subsidized its privately owned ocean shipping. But it is a remarkable fact that the term "ship subsidy" in connection with our ships operating in foreign trade, seems to have the same effect as waving a red flag in the face of a bull. A number of important and influential newspapers in the United States have repeatedly stated, and their statements are apparently believed by a large number of American citizens, that the purpose of a subsidy for our ships operating in foreign trade, is merely to take money out of the pockets of the farmer and the pockets of the working man and put it into the pockets of the Wall Street gang.

There has never been built up in the United States any great industry without the aid of a subsidy in one form or another. Our transcontinental railway companies were subsidized in the building of the transcontinental railroads, by which the United States was opened up to development, by the granting of scores of thousands, if not hundreds of thousands, of acres of the public lands. Every manufacturing industry in the United States has been built up and is being maintained under the protection of a subsidy in the form of a protective tariff—that is the case with steel, automobiles, machine tools, woolen and cotton goods and very many other items.

Our coastwise shipping is absolutely protected against foreign competition by navigation laws which forbid foreign-owned ships from carrying passengers or merchandise from one United States port to another United States port. If a foreign-owned ship operating between San Francisco and the Asiatic ports, carries American passengers from San Francisco to Honolulu, the foreign shipowners are fined $1,000 for each passenger so carried.

As pointed out above, the shipbuilder himself is protected against foreign competition by the practical impossibility of a foreign-built ship being entered in the American registry. But, American citizens who desire to operate American-built ships in foreign trade are apparently the only citizens who have not heretofore received government aid for the business in which they desire to engage.

We are further handicapped in engaging in foreign trade in our own ships by the fact that a very large part of our merchant tonnage was built during the war when the only thought was to transport food and supplies for the American Expeditionary Force and for our allies. Many of these ships are not fitted to carry freight of a specific character such as frozen beef from the Argentine, are expensive to operate, and are slow in speed. Slowness in speed not only detracts from the usefulness of these ships as naval auxiliaries in time of war but also greatly reduces their earning power, as many passengers will not travel on a slow ship if a faster ship is available and valuable cargoes, of which silk is a marked example, on account of the great amount of money tied up in the shipment, which is not released until the merchandise is placed on the market and sold, will not be shipped on anything but the fastest ships available. Of our total seagoing merchant tonnage of 11,164,000 only 2,024,000 tons have a speed greater than twelve knots, while of Britain's total merchant tonnage of 20,000,000, 8,716,000 tons have a speed greater than twelve knots.

Considering the nations which can be classed as the leading maritime nations, that is, the United States, Britain, Japan, France, Italy, and Germany, the number of ships in operation having a speed greater than twelve knots is as follows:

United States	233
Britain	1,281
Japan	172
France	149
Italy	153
Germany	166

The number of ships in operation having a speed greater than eighteen knots is as follows:

United States	32
Britain	131
Japan	2
France	12
Italy	15
Germany	2

The number of ships in operation having a speed greater than twenty-one knots is as follows:

United States	5
Britain	40
Japan	2
France	5
Italy	5
Germany	2

For the six years, 1922 to 1927, the building of ocean-going merchant ships of 2,000 gross tons and over had practically ceased in the United States, while all other nations have built and are building a large number of these ships to capture and hold the world's trade; the figures are as follows:

United States	18	199,884
British Isles	741	4,588,847
Japan	71	350,556
France	80	507,329
Italy	91	805,945
Germany	221	1,348,533

During the years 1928 and 1929, merchant ships of 2,000 gross tons and over were launched as follows:

	1928	*1929*
United States	6	14
British Isles	238	241
Japan	17	22
France	11	8
Italy	15	16
Germany	40	40

At that rate it will not take very many years to place all of the world's carrying trade in the hands of foreigners, and if that happens, our prosperity will begin to decline. As already pointed out, of our yearly foreign-world trade of $8,000,000,000, approximately 55 per cent of it is export. With foreign carriers, much of that export trade would be taken from us by foreign manufacturers through the simple expedients of increasing the freight rates for American shipments and either reducing or discontinuing entirely the number of sailings from American ports to foreign ports where our goods have found a market. To illustrate how our export trade fluctuates with the availability of our own shipping, the figures relative to our South American trade will be of interest.

Our average trade with South America for the five years before the war was $330,000,000 annually, in 1915, $360,000,000, in 1916, $572,000,000, with a further consistent and steady increase year by year until in 1920 it reached $1,384,000,000. In that year the foreign commercial interests were again in a position to cater to the South American trade and consequently the foreign steamship lines were more interested in carrying the products of their own nationals than they were in carrying the products of Americans and our trade fell off, dropping in 1921 to $569,000,000, a loss of $815,000,000 in one year.

The American flag lines to South America were then inaugurated by the U. S. Shipping Board and our trade to South America again began to increase until it reached, in 1926, $1,011,000,000, in 1927, $956,000,000, so that in six years' time we still averaged $400,000,000 per annum behind the trade which we had reached in 1920 and which we could not hold because of the lack of our own carriers.

Of our foreign trade in 1927, 1928, and 1929, amounting to $23,582,961,000, only 34 per cent was carried in American ships and 66 per cent was carried in foreign ships. For carrying that value of foreign trade there were paid in round numbers $2,280,000,000 in transportation charges, of which $1,504,800,000 went to foreigners, and only $775,200,000 went to Americans.

The total transportation charges (both passenger and cargoes) in the water-borne foreign trade of the United States for the year 1928 amounted to $1,000,000,000, for the year 1929, to $1,100,000,000.

The more and better merchant ships we have operating, the more of these huge sums will go into the pockets of American citizens and the less will go into the pockets of foreigners.

The Merchant Marine Act of 1928, for the first time in over fifty years, provides protection and inducements to American ocean shipping which counteracts the advantages heretofore possessed, through subsidies, etc., by foreign ocean shipping. It places American shipping in a position to meet foreign competition. It is constructive instead of being obstructive, and it provides for the proper development of the American owned and operated merchant marine en-

gaged in ocean trade. The most important features of this act are authorization for:

1. United States mail franchise contracts for ten-year periods, the payments for services under such contracts being based upon the distance traveled and the speed performance of each vessel.
2. Vessel insurance by the United States government for American ships at more equitable rates than have heretofore been available.
3. Loans for new construction of American ships up to 75 per cent of the cost thereof at or about three per cent interest per annum, with payment spread over twenty years.

Another item of interest in connection with ocean shipping is marine insurance. Our exports for the year 1927, as previously stated, amounted to $4,050,000,000, our coast and lake commerce for the same year amounted to $7,780,000,000, our ocean shipping of 11,164,000 tons, valued at from $35 to $120 per ton, amounted to an additional $781,148,000, which gives us a total of $12,611,148,000 for ships and cargoes that must be insured. Assuming a premium rate of 3¼ per cent, which is the average figure charged for marine insurance on hulls and a premium rate of $0.10 per $100 which is the rate on general merchandise cargoes from U. S. Atlantic ports to England and France gives a total approximate annual premium of $37,264,310. The ratio of losses to premiums averages 80 per cent so that the gross profit on insurance of American ships and cargoes approximates $7,452,862 yearly and the greater part of this large sum paid by American shipowners and American merchants and manufacturers is paid to foreign marine underwriters.

So far, this question of foreign trade and the American merchant marine has been discussed solely on a peace-time basis. There is another feature which should always be considered in this connection and that is the effect of a war on our foreign trade if we are depending upon a foreign merchant marine to carry our goods.

At the outbreak of the Boer War in 1899, a great number of the ships carrying our foreign trade at that time were British and a very large number of these ships were withdrawn from the American carrying trade to serve as troop transports and as supply ships to carry the British forces and British supplies to South Africa. While our foreign trade at that time was inconsiderable in comparison with our trade today, the losses incurred by American shippers were tremendous due to the congestion in warehouses and railroad yards and to the spoiling of shipments that were perishable in their nature.

At the outbreak of the World War in 1914, the British and French withdrew a great number of their merchant ships for war service and all German ships remained in port to avoid capture by the British and French cruisers. In a very short time the piers and warehouses were full to overflowing, shipments could not be unloaded from railroad cars, the railroad terminals and the railroad lines leading out of those terminals for miles, were filled with cars which could not be unloaded and the loss to American shippers ran into hundreds of millions of dollars. A great part, if not all, of which loss would have been avoided had American ships been available for carrying American goods.

It is evident from the foregoing that it is the duty of every loyal American citizen to use his utmost endeavors in every way to build up and maintain an adequate American owned and American operated merchant marine and to see that it carries much the greater part of our foreign trade.

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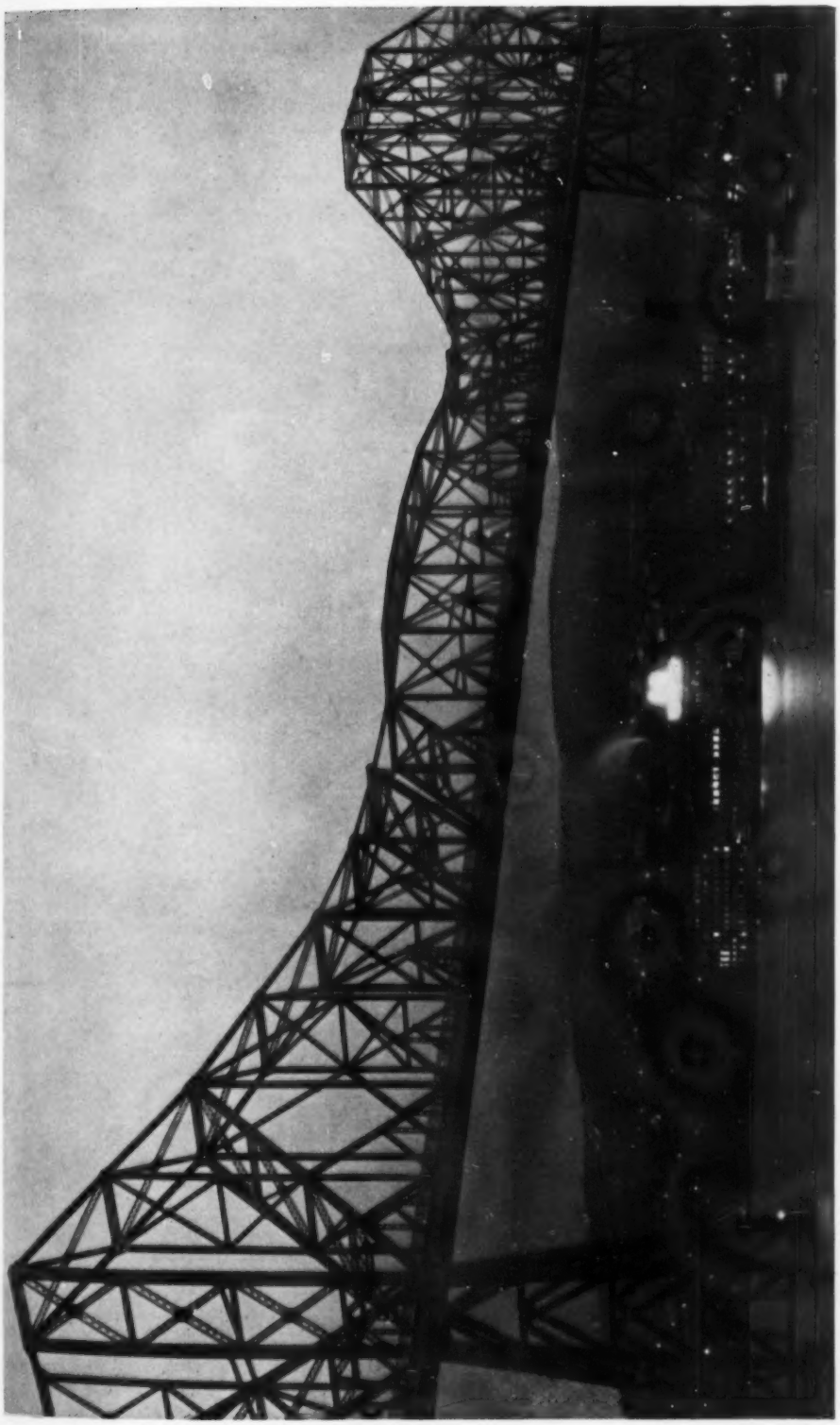
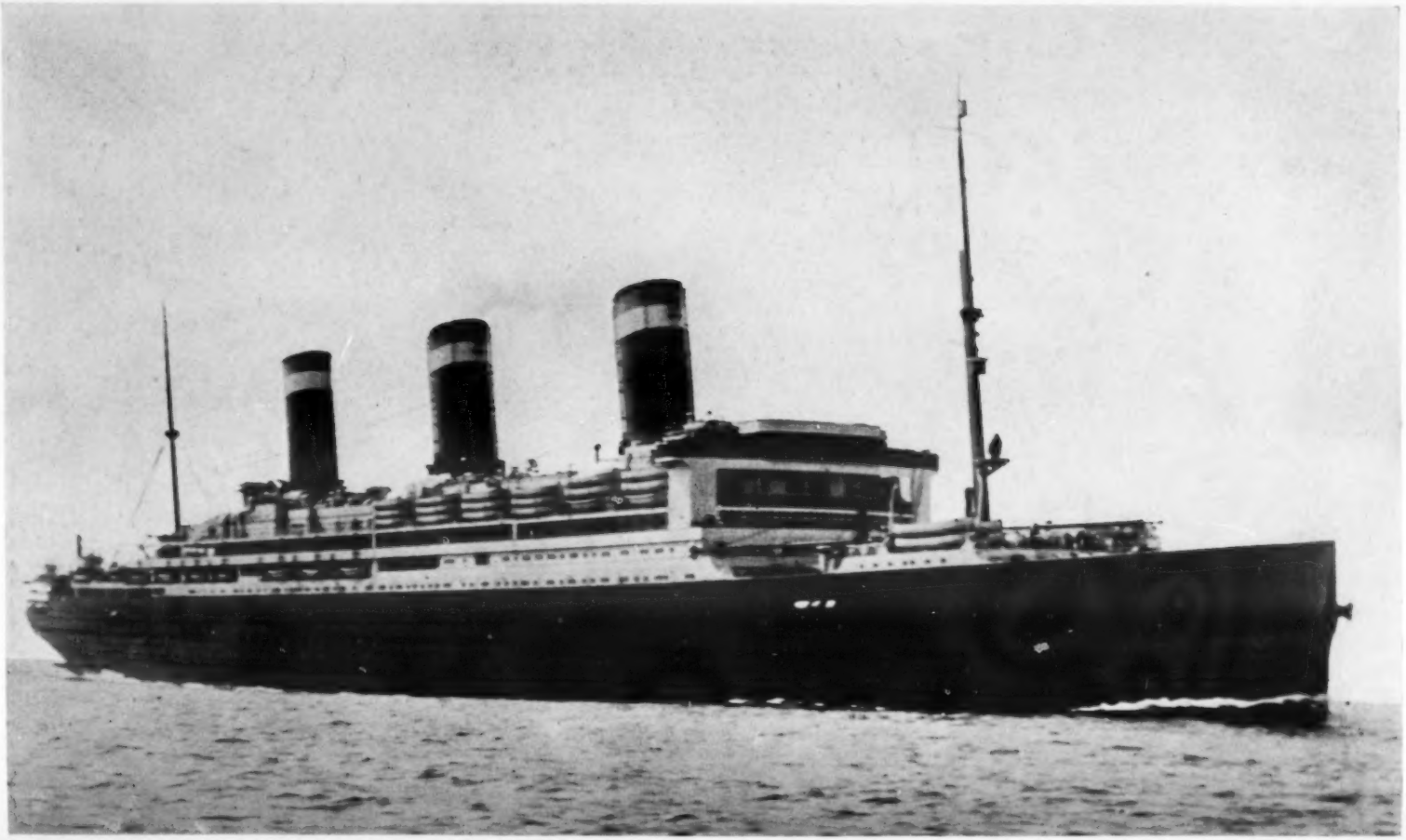


By Ewing Galloway, N.Y.

WHERE SHIPS CAN LOAD AND UNLOAD AT THE FACTORY DOOR



THE *LEVIATHAN*

Official Photograph—U. S. Army Air Corps

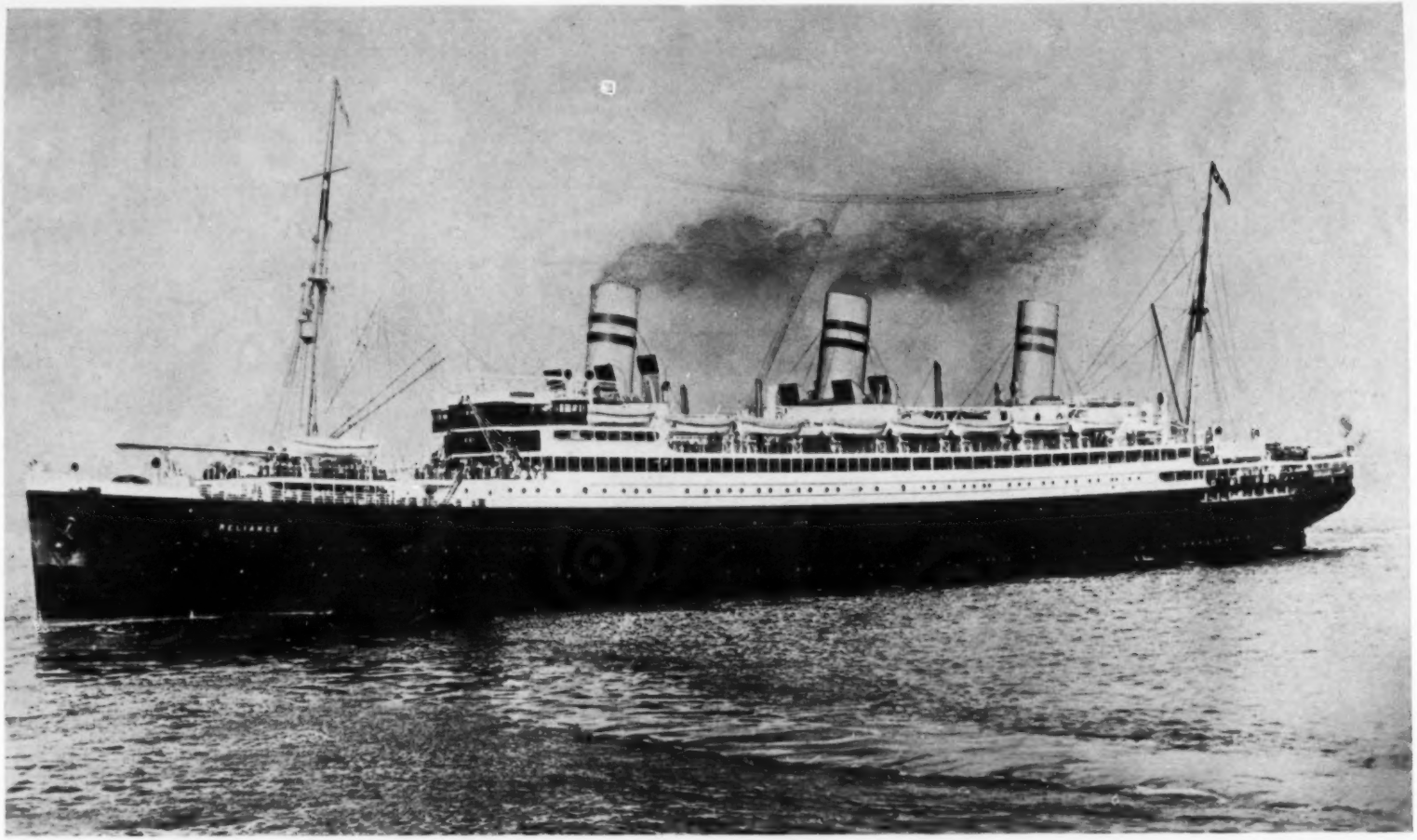
THE MERCHANT MARINE HELPS OUR SEACOAST CITIES GROW

Official Photograph—U. S. Army Air Corps

ONE OF THE SCORES OF PLACES WHERE SHIP AND RAIL MEET

Official Photograph—U. S. Army Air Corps

ONE OF THE SCORES OF PLACES WHERE SHIP AND RAIL MEET



STEAMSHIP *RELIANCE*

Courtesy Bureau Supplies and Accounts, Navy Department

NAVAL OPERATING BASE, HAMPTON ROADS, VIRGINIA

Courtesy Bureau Supplies and Accounts, Navy Department

NAVAL OPERATING BASE, HAMPTON ROADS, VIRGINIA

By Ewing Galloway, N.Y.

CARRYING AMERICAN GOODS OVERSEAS

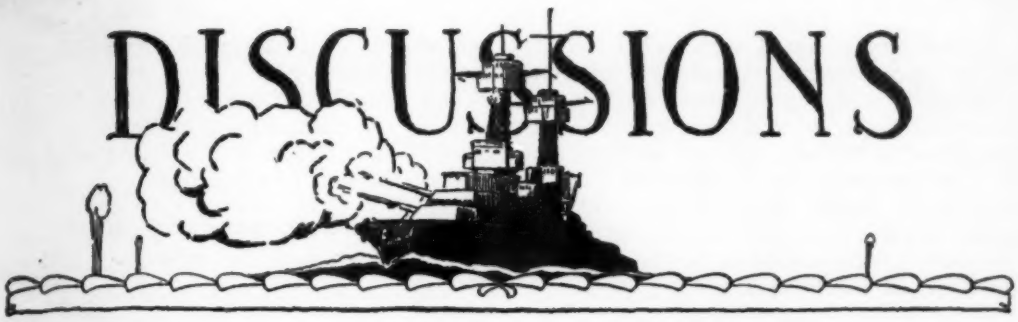
International News Photo, Inc.

OUR SEA-BORNE TRADE IS CARRIED IN SMALL SHIPS AS WELL AS IN LARGE ONES

OUR SEA-BORNE TRADE IS CARRIED IN SMALL SHIPS AS WELL AS IN LARGE ONES

International News Photo, Inc.

DISCUSSIONS



Vulcan Gearing and Hydraulic Couplings

(See page 650, July, 1929, PROCEEDINGS)

MR. FRANK J. SPRAGUE, President Sprague Safety Control and Signal Corporation.—I was much interested in the description in the July issue of a so-called new hydraulic coupling, reported to have been "originated by the invention of Professor H. Foetlinger, but since greatly extended in the scope of its application by patents granted to Dr. Gustav Bauer."

I am not familiar with these patents, but I may be permitted to call attention to a somewhat early publication because of its possible relation to this development, and also because it details what I think is the first recorded experiment illustrating the principle of the Diesel engine, which if followed up might have resulted in this type being developed by the U. S. Navy.

While a midshipman of the class of '78, I had the good fortune to secure orders to attend the first British Electrical Exhibition, held at the Crystal Palace, Sydenham, in 1882, and while there to serve as secretary of the jury which had to pass upon dynamo-electric machines, electric lights and gas engines. In this capacity I organized and carried out, in connection with several noted English scientists, an elaborate series of tests which were recorded in a voluminous report to the Hon. William E. Chandler, Secretary of the Navy, in 1882-83, and published by the Office of Naval Intelligence as "General Information Series No. 2", in 1883. A similar report was epitomized before one of the English technical societies by one of my associates, Professor W. Gryll Adams of the Wheatstone Laboratory, Kings College.

Among the machines tested was a Crossley 16-hp. "Otto" 4-cycle gas engine, to measure the power of which there was placed at our disposal by Mr. R. H. Froude a water dynamometer, the replica on a reduced scale of one designed and constructed by the late naval architect, William Froude, F.R.S.

A description of the original one, which was used to test the engine shaft power of a ship in dry dock, appeared in the *Proceedings* of the English Institution of Mechanical Engineers, July, 1877, this description with my modified drawings being reproduced on pages 11-13 of my report.

From this it will be noted that the dynamometer had a two-channel disk with oblique pocket divisions, which was rotated in close juxtaposition to like divisions on either side contained in an enclosing chamber, the free space being filled with water. A sliding partition was provided to control the vortex action, and a circulating pipe to keep up a supply of cool water to take up the place of that heated by the internal reaction when the central turbine was rotated.

Used as a dynamometer, the outer casing was held from turning by an extended arm and a measuring spring or weight, but if this had not been used and the water circulation not throttled, the rapidly built up reaction would have driven the outer case around, as a definite hydraulic clutch, not in synchronism with the primary driver but with a definite small lag or slip dependent upon the output, the energy represented by this slip being converted into heat, just as would be the case with a perfectly acting mechanical or magnetic coupling.

There was here, therefore, all the elements of a practical hydraulic coupling which in general principle of construction and operation seems to have been the antecedent of the coupling described.

In this connection, I would also call attention to an ignored, or lost-sight of, contribution to early experimental history because of its relation to a great power development—the Diesel engine. Although at the time having no practical outcome, if followed up it might have made our Navy the sponsor of this all-important advance, for to the best of my knowledge the experiment I will describe had no precedent.

In the introduction of that section of my report which detailed the jury's activities, I called attention to the low efficiency of the steam engine and stressed the necessary and probable advent of other forms of heat engines.

In the Otto engine tested, the charge of air and gas, under control of a governor, was after compression exploded by a small charge pocketed in a slide valve which was itself first ignited by an exterior gas jet. To prevent abnormal heating the cylinder was water jacketed, the amount of water used being under control. Wishing to get the utmost possible out of the 16-hp. engine it was forced to the limit, up to nearly 28-brake horsepower, while pressure diagrams were continually made.

These diagrams were promptly studied, and it was noticed that as the cylinder heated up under the forced duty an irregularity developed, and instead of the charge being exploded only at the end of the stroke, there were several instances in which there were evidently pre-explosions as well as late exhausts, the former of which could not be caused by the normal operation.

Another cause was therefore sought, especially when in addition the ignition was occasionally blown out, but without immediate stoppage of engine. As a result, and on the suggestion of one of the attendants, at the conclusion of a regular half-hour test, with the engine missing fairly steadily, the water was throttled down, the ignition cut off and the engine kept on running for several minutes, the explosions being caused by the high heat of compression, augmented by that in the cylinder walls.

And there we stopped, so far as this particular operation was concerned, but it would seem that this experiment illustrated the vital principle of the Diesel engine, and was the first recorded instance of any heat engine operated by a mixture ignited by the heat developed because of compression of the gas mixture.

The record of these tests, with full expansion diagrams and a statement of the conclusions arrived at, are found on pages 7-32 of the text of my report.

The Government of Japan

(See page 795, September, 1930, PROCEEDINGS)

COMMANDER FRED F. ROGERS, U. S. Navy.—Much of the inner working of the government of Japan is based on the system of advice and control by elder members of clans which still, in spite of many assertions to the contrary, is a strong factor in the Japanese social organization. These elders are not now the leaders of the military clans, having given way to leaders of industry and state, but the practice of looking to the heads of families, or clans, for advice and counsel is still in existence. Only one of the old Genro, or elder statesmen, remains, but it is not only unlikely that the Privy Council will function as did these old statesmen of the Meiji era, when heads of clans experienced in business and state affairs are available to make up its membership.

Lieutenant Commander Wentworth has chosen a subject which requires much reading and checking of available data and familiarity with Japanese names, and it is not surprising that he has made some misstatements which, while of little consequence when considering the article as a whole, should not be left uncorrected. For instance, he states (bottom of page 795): "In fact the warships of the three European powers had invaded the Japanese waters before 1845 and finally had attacked the Straits of Shimonoseki in 1863, which were guarded by the powerful Satsuma clan." From the previous sentence it is inferred that the three European powers were France, England, and Russia. Russia was not mixed up in the Shimonoseki affair and the straits were not guarded by the Satsuma clan but by the Choshu clan.

On page 799 he states: "Gradually, however, they have passed away and but one remains, Prince Yamagato, who was recently consulted by the Emperor in the change in the premiership." Marshal Prince Yamagato, head of the Choshu clan, died February 1, 1922. Prince Saionji is the

only living Genro, being now eighty years of age.

Are We Raising a Frankenstein?

(See pages 598, July, 1930, and 1029, November, 1930, PROCEEDINGS)

CAPTAIN FRANK JANSEN.—When discussing my article Commander Topp has overlooked the following very pertinent points:

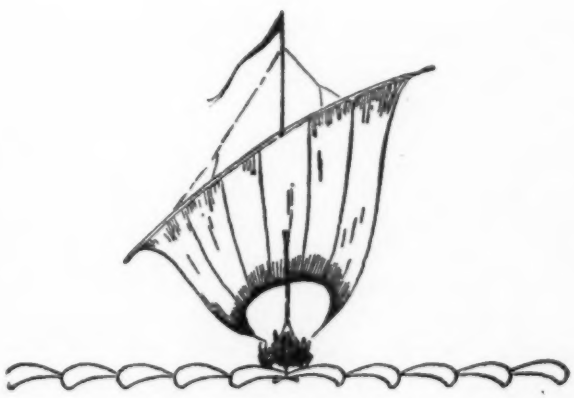
(1) That the great majority of licensed officers in the American merchant marine have not been trained on the various state training ships, but have obtained their training by serving before the mast in the merchant marine. There are no schools, except private schools, where these men can obtain the necessary technical training.

(2) That the graduate of the training ship must prepare himself for the chief officer's, as well as master's, examination after he has left the training ship and that there are no schools, except private schools, where he can obtain the necessary technical training.

(3) That the San Francisco Navigation School is a night school, formerly run by an employee of the Hydrographic Office, who worked there in the day time and taught school at night to supplement his earnings. One certainly could not consider such a school as any standard.

Commander Topp seems not to have understood the spirit of my article and overlooked the constructive side entirely.

That conditions are as bad as I have described them is well known to anyone who has ever given the training of our merchant officers a thought. In the last paragraph of his discussion Commander Topp himself admits that the government is waking up to this dire need of properly training our merchant officers.



PROFESSIONAL NOTES

NOVEMBER 2 TO DECEMBER 1

COMMANDER D. B. BEARY, U. S. NAVY

LIEUTENANT COMMANDER D. C. RAMSEY, U. S. NAVY

AND

PROFESSOR HENRY BLUESTONE, U. S. NAVAL ACADEMY

UNITED STATES

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UNITED STATES

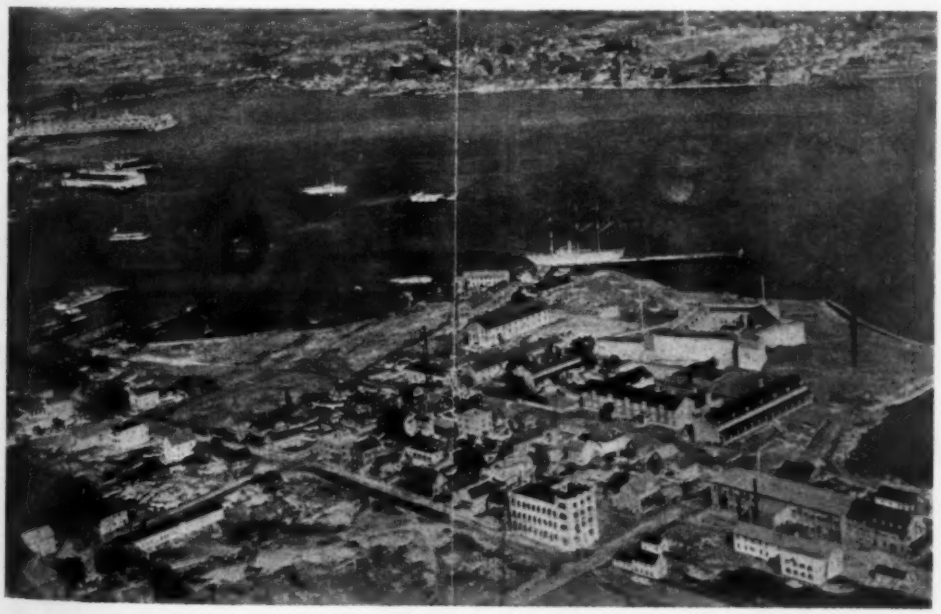
Coast Guard Academy

To graduate young men with sound bodies, stout hearts, and alert minds, with a liking for the sea and its lore, and with that high sense of honor, loyalty, and obedience which goes with trained initiative and leadership; well grounded in seamanship, the sciences, and the amenities, and strong in the resolve to be worthy of the traditions of the commissioned officers in the United States Coast Guard in the service of their country and humanity, is the mission of the Academy.

Merchant Marine Bulletin, November. By George H. Toole.—The important work of training commissioned officers for the United States Coast Guard is carried on at the Coast Guard Academy at New London, Connecticut, an institution similar in many respects to the Naval Academy at Annapolis and the Military Academy at West Point. The wide range of activity of the Coast Guard demands officers of the highest type, versatile men capable of meeting emergencies of the most diversified character, so that the standards of this institution are unusually high. The cadets are given a comprehensive course which fits them to carry out the many duties assigned to this branch of the service.

Although the Coast Guard service was started in 1790, no provision was made at that time for the training of officers for this service. Commissioned officers were chosen from among those who had served in the Navy and the merchant marine until 1876, when Congress made provision for a two-year course of training. The first school was established at New Bedford, Massachusetts, and consisted of a training ship, the topsail schooner *Dobbin*, and a drill shed and rigging loft ashore. The *Chase*, a bark-rigged sailing vessel built specially for the purpose, was completed in 1878 and superseded the *Dobbin* as the practice ship.

In 1890 it was decided to place the school at New Bedford out of commission and to fill the vacancies in the commissioned personnel by appointing graduates of the Naval Academy. This plan was abandoned in 1894, and the *Chase* was returned to commission as practice ship, although the shore establishment at New Bedford was given up. The *Chase* spent the summer season at sea, while the winters were spent in port, first at Charleston, and later at Mobile, Pensacola, and St. Petersburg. In 1900 buildings were erected and drill and recreation fields laid out at Arundel Cove, South



U. S. Coast Guard Academy, New London, Connecticut, where an excellent opportunity is offered young men of the right caliber to complete their education at government expense and to become commissioned officers in the U. S. Coast Guard, one of the military services of the United States, afloat and ashore.

Baltimore, and the school became a land-faring institution.

The facilities of the school were fast proving inadequate, so in 1907 the *Itasca,* a steamer with auxiliary sail power, took the place of the *Chase* as practice ship, and in 1910 the shore-going establishment was moved from South Baltimore to Fort Trumbull, New London. In 1920, the gunboat *Vicksburg,* a sailing vessel with auxiliary steam power, was renamed the *Alexander Hamilton,* in honor of the first secretary of the treasury, whose formal recommendation led to the creation of the Coast Guard, and succeeded the *Itasca* as practice ship. Congress recently appropriated funds for a new Coast Guard Academy, which is to be built on the New London side of the Thames River. The new academy will be dedicated in 1931, and will be one of the finest educational institutions in the United States.

Competitive examinations, open to high school graduates, are held annually, and those who pass the mental and physical examinations are eligible for appointment as cadet. The course of instruction is at present of three years' duration, and includes courses in English, mathematics, physics, chemistry, mechanics, ballistics, engineering, naval architecture, electricity, navigation, astronomy, international and military law, and allied subjects. Beginning with the class entering the Academy in 1931 the course of instruction will extend for four years. During the practice cruises, which take place in the summer months, the cadets visit various ports of the United States, Europe, and Africa, and are given practical instruction in seamanship, gunnery, and various other phases of their work.

The cadets who complete the course and graduate from the academy may be commissioned as ensigns in the Coast Guard, having rank with second lieutenants in the Army and ensigns in the Navy. Promotion is made by seniority through the successive grades, lieutenant (junior grade), lieutenant, lieutenant commander, commander, and captain, and in each of these grades they receive the same pay and allowances as officers of the Army and Navy of corresponding grade and have relative rank with them. The present cadet corps consists of 143 members, representing 32 states, and the faculty is composed of 21 officers and professors. The superintendent of the academy is Captain H. G. Hamlet, who is himself a graduate of the school.

Broad Fleet Reorganization to Follow Concentration on April 1.

Washington *Post,* November 29.—A broad reorganization of the United States fleet was announced yesterday by Secretary Adams to take effect April 1, 1931, following fleet concentration at Panama.

The new organization divides the fleet into a battle force, scouting force, submarine force, and base force, provides for a second and third in command of the fleet and makes various other administrative changes.

The major unit of the fleet will remain in command of the present commander in chief, Admiral Jehu V. Chase, whose flagship will be the battleship *Texas.* The cruiser *Chicago,* on completion in the spring, will replace the *Texas.*

The newly created battle force on the Pacific will be composed of battleships, cruisers, destroyers, aircraft and minecraft, which includes the aircraft at Pearl Harbor, Hawaii.

Admiral Frank H. Schofield, commander in chief of the battle fleet, will retain his rank but will have his title changed to commander of the battle force, becoming second in command of the fleet. His flagship will be the battleship *California.*

The scouting force on the Atlantic will be composed of cruisers, destroyers, aircraft, and the training squadron.

Vice Admiral Arthur T. Willard, commander of the scouting fleet, also will retain his rank, but have his title changed to commander of the scouting force, becoming third in command of the fleet. His flagship will be the battleship *Arkansas* until the new cruiser *Augusta* is completed.

The submarine force will comprise all submarines of the fleet and of the submarine bases at New London, Coco Solo, and Pearl Harbor. Rear Admiral T. C. Hart, commander of the control force, will have his title changed to command of the submarine force, retaining the submarine tender *Bushnell* as his flagship.

The base force will be composed of auxiliary vessels not assigned to other forces, together with combatant vessels, aircraft, and land forces assigned for service with the fleet of base defense.

Rear Admiral William D. MacDougall,

Vessels Under Construction, U. S. Navy—Progress as of October 31, 1930

Type Number and Name	*Contractor*	*Per cent of Completion*				*Probable date of completion*
		Nov. 1, 1930		Oct. 1, 1930		
		Total	On ship	Total	On ship	
LIGHT CRUISERS						
Louisville (CL28)	Puget Sound Navy Yard	96.4	95.4	94.6	93.6	1/31/31
Chicago (CL29)	Mare Island Navy Yard	95.4	93.7	93.4	90.5	3/13/31
Augusta (CL31)	Newport News S.B. & D.D. Co.	91.3	91.3	88.8	88.8	3/13/31
New Orleans (CL32)	New York Navy Yard	2.9	1.2	2.9	1.2	6/ 2/33
Portland (CL33)	Bethlehem S.B. Corp. (Fore River)	29.6	17.2	26.2	15.4	8/15/32
Astoria (CL34)	Puget Sound Navy Yard	3.9	.4			10/ 2/33
Indianapolis (CL35)	New York Shipbuilding Co.	34.5	28.8	28.4	21.9	8/15/35
Minneapolis (CL36)	Philadelphia Navy Yard	1.4	.3	1.1	.2	3/ 2/34
CL38	Mare Island Navy Yard					2/11/34
FLEET SUBMARINES						
V-7	Portsmouth Navy Yard	17.6	17.	15.5	15.	8/ 1/32

Authorized by act of August 29, 1916.
12 Destroyers Nos. 348 to 359 inclusive—no funds for construction.
1 Transport No. 2—no funds for construction.
2 Fleet submarines Nos. 170 and 171.
1 Neff submarine No. 108—no funds for construction.

Authorized by act of February 13, 1929.
9 Light cruisers.
1 Aircraft carrier.

senior commander of the fleet base force, will have his title changed to commander of the base force, with the submarine tender *Argonne* as his flagship.

GREAT BRITAIN

Officers for the Navy

London *Times*, November 26.—The appointment, announced in the *Times* yesterday, of an Admiralty committee to consider the question of the recruitment of officers for the Royal Navy indicates a reopening of the subject which was first brought into prominence by the late Lord Fisher. His conviction was that any boy with the requisite ability and coming up to the necessary standard should have an opportunity of entry as a cadet. To this end he would have made the cost of naval education a charge on the state, as it is already in part, and would have provided scholarships whereby a boy from an elementary or secondary school might go to Osborne and Dartmouth, irrespective of the financial position of his parents.

It was not merely a desire to obtain for the Navy a number of picked candidates from the poorer classes which was at the back of this suggested reform. The duration and cost of a naval education, owing to the progress of science in the fleet, had much increased, and this fact had operated to shut out a number of entries from those classes which for generations had supplied cadets of a right sort. Officers who had entered when the training was a two-year course in the *Britannia* found themselves unable to put their boys into the service when a four-year college course was substituted and when it was calculated that not less than a thousand pounds was needed to be spent on a boy for the Navy up to the time when he became a lieutenant. The objection to the proposed free education scheme was financial and not lack of sympathy in principle. Post-war conditions have, if anything, retarded its chances of adoption. The Geddes committee of 1922, for example, doubled the fees at Dartmouth College. The Admiralty have the power of admitting a certain number at reduced rates, a proportion of them being the sons of officers of the services. But the general position is that lack of means may, and does, keep out certain aspirants who might otherwise become useful officers. Furthermore, there has always been a strong feeling among educationists and some naval officers that the present age of entry into Dartmouth is too low.

So important a subject as the recruitment of officers should naturally be reviewed from time to time in the light of experience, and no surprise was felt when in March last, during the debate on the Navy estimates, Mr. Alexander, the First Lord, after referring to the consideration which had been given to lower-deck promotions, said that he intended "to extend the inquiry to cover the whole question of the entry of cadets and officers."

There are three main channels for the supply of naval officers at the present time. The first is via Dartmouth College, where a four-year course is provided from the age of thirteen and one-half years. Entries take place three times a year, and the fees are £150 per annum. Dartmouth was built to accommodate 600 cadets, and the average number now there is 500, and is decreasing. During the present year about 106 have been admitted, as compared with 130, 148, and 151 in the three preceding years. The second mode of entry is by a civil service examination at about the age of eighteen, held twice a year. This special entry, as it is called, was started in 1913, when it was necessary to supplement the supply of junior officers, and has worked very well in practice. The cadets have an intensive course of one year in H.M.S. *Erebus* at Devonport, and reports show that with their broader outlook on life they make very suitable officers.

The vacancies offered are much fewer than via Dartmouth. For the examination to be held this month, only six executive and ten engineering cadetships are offered, or at the rate of thirty-two per annum, less than one-fourth of those at Dartmouth. A very few cadets from the nautical schools, the Conway, Worcester, and Pangbourne College, are accepted and join up with the special entries in the *Erebus*. It has often been advocated that the Navy might rely entirely on the entry from public schools at the age of eighteen. The Duke of Montrose put forward this view in a discussion he initiated in the House of Lords in May, 1927, but Lord Stanhope, for the Admiralty, replied that the main objection was that it was more than doubtful whether they would be able to get sufficient numbers if they relied only on one system.

The third avenue of entry to commissioned rank, from the lower deck, has two main forms: one the early selection of petty officers and men to qualify as mate or mate (E) and later as lieutenant; the other by the promotion of warrant officers in later years as a reward for meritorious service. The former has not yet established bona-fide promotion to the quarter deck because the candidates have either been too old to be able to reach the higher ranks, or have not had that specialist training which is in increasing demand as a qualification for advancement beyond lieutenant commander. This branch of the subject, however, is under investigation by another committee. They are "to review the working of the system by which warrant officers, petty officers and ratings may qualify for promotion to the rank of lieutenant and above through the rate of mate, and to report whether any changes are desirable." It will be noted that this committee is strictly a service one, as is fitting, but it may be hoped it will examine in the course of its survey the much greater opportunities open to men from the ranks in the Army and Royal Air Force.

Ships Nearing Completion

London *Times*, October 29.—The following list of the vessels which are expected to be completed for service in the Royal Navy during the coming twelve months: Cruiser, *Exeter*, at Devonport, end of June, 1931; flotilla leader, *Keith*, at Barrow, March; destroyers, *Brilliant*, *Blanche*, and *Boreas*, Tyne, February; *Boadicea* and *Brazen*, Tyne, March; *Basilisk* and *Beagle*, Clyde, March; *Acheron*, Southampton, uncertain (special type); sloops, *Hastings*, November 27, 1930; *Penzance*, December; *Fowey*, August, 1931; and *Bideford*, mid-November, 1931, all at Devonport; *Shoreham*, at Chatham, June, 1931; submarines, *Phoenix*, at Birkenhead, December; *Regent*, *Regulus*, and *Rover*, at Barrow, November, December, and January respectively; *Rainbow*, at Chatham, September, 1931; destroyers for Canada, *Saguenay* and *Skeena*, at Southampton, March and April, 1931. The total is twenty-two, all but one of which are small craft.

FRANCE

New Supersubmarine

Naval and Military Record, October 27.—The French submarine *Prometheus* was launched at Cherbourg today. She is 99 meters long, displaces 1,550 tons on the surface, and 2,000 tons under water, and carries 12 torpedo tubes, one 4-inch gun, a smaller gun, and a machine gun. She can cruise for thirty days.

France's naval program includes twenty-five similar submarines, of which two are in the course of construction.

Reorganization of the Technical Board

Le Yacht, October 25.—Anyone having the patience to examine will surely find, in the files of the *Yacht* for the last twenty-five years, several articles bearing the above title. In fact, periodically, well-intentioned ministers feel the need of reorganizing the general board of the Navy with the view to making it more effective. Another effort of the same nature has just been made.

The technical board was created by an order of April 21, 1905, to replace the former board on works the existence of which dates from the middle of the last century. This board on works rendered useful service at the time when the evolution of material, rapid as it may have seemed at the time, was still less rapid than it was going to become. On the files of this board will be found the proof that the chiefs of the old Navy, notwithstanding their naturally conservative attitude, generally judged sanely the important questions submitted to them, and that they had no fear of innovation.

However, composed exclusively of officers of a very high rank and advanced in age, the board on works was not competent to decide problems relative to new material, particularly relative to submarines. In 1903, there was added to this board, a committee on submarines composed of officers that had just been in command of such craft and engineers who had constructed and experimented with them. But the difference between the two elements was too marked: one was perhaps too old and the other a little too young. The reorganization

of 1905 consisted in merging them into one under the name of naval technical board.

The technical board was divided into four sections each headed by a rear admiral: the section of high seas ships, dealing with battleships and cruisers; the section of defense ships, dealing with torpedo boats and submarines; the permanent board on trying ships; and the board on supervision and revision of armament regulations. These two boards had already been in existence but were independent. It appeared wise to combine them under the authority of the vice admiral presiding over the technical board, in order that there be more unity of view in the conception, trial, and operation of naval material. The four sections could meet in joint sessions.

But it was not long before it was discovered that the board on armament regulations hardly had any business other than questions in which the administrative element was predominant, and that it was a useless hinderance to the work of the technical board. In 1909 autonomy was restored to this board, and at the same time the jurisdiction of the testing board was extended. Thereafter, it had absolute supervision over all trials to which new ships are subjected, including submarines which until then were not under its supervision, as well as over the local boards to which it could delegate part of its powers whenever it seemed advisable.

The president and most of the members of the testing board formed part of the technical board, but on the whole the board functioned independently. Thus things went until 1928, the date on which the minister decided to have the president of the technical board perform the duties of the president of the testing board. "Thus," it was stated, "would be secured unity of action indispensable at present between the technical board charged with supervising the material from the very outset when the craft is conceived and the board charged with supervising tests aboard the ships."

The recent reorganization has been inspired by the same conception. The testing board becomes more than ever an emanation of the technical board, to which has again been attached the board for the supervision and revision of armament regulations. Thus, according to the statement explaining the reasons for the order, "the jurisdiction given to the president of the technical board affords him the means of supervising the execution of the successive sections of the naval program from the moment when the plans are drawn to the time when the completed units are attached to the active forces." That would be true if this officer general held his office for a long time. But we have just seen a vice admiral leave his post at the end of hardly one year to take a command at sea; and the one succeeding him will not be able to hold the post more than two years if he holds until his age limit. It is fairly evident that an officer general reaching the top of the ranks has a broad enough experience not to need a long apprenticeship so far as material and organization are concerned. But he may be less well prepared for the discussions with the technical bodies in which continuity of life is more assured than in the General Board. Have we not seen very lately the members of the General Board give each a different answer when consulted individually on a very important question? It is to be hoped that the technical board will succeed better in establishing its doctrine.

GERMANY

Six Years' Construction Program

Naval and Military Record, November 5. —The budget for 1931 will be submitted to the Reichsrat tomorrow by the Chancellor, Herr Bruening. The budget of the Ministry of Defence has been cut down by 7,000,000 marks—a slight sum compared with the cuts in the budget of other ministries. The defence budget allows 34,700,000 marks—9,200,000 marks more than the previous year—for ship construction and armament, including a first installment of 10,830,000 marks for the armored cruiser "B," which is to replace the battleship *Lothringen,* built in 1904. The estimated total cost of the cruiser "A," which will replace the battleship *Pruessen*—built in 1903—is 75,000,000 marks.

The construction of the cruiser "B" is expected to begin next year, and be completed in 1934, its total cost being 73,000,000 marks. The total cost of the cruiser *Leipsig,* which is expected to be finished next year, is 42,000,000 marks.

The program of the ministry of defence for the next six years includes the construc-

tion of cruisers to replace the *Brunswick* and *Elsass*, the construction of four destroyers, five torpedo-boats, five coastal vessels, two artillery training vessels, six mine-searching boats, and several smaller vessels.

The estimated average cost of the program of construction for the next six years is 50,000,000 marks.—Reuter.

TURKEY

The Yavouz Sultan Selim

Naval and Military Record, November 5.—The complete refitting of the ex-German battle cruiser *Goeben* has the effect of maintaining in the Middle Sea a factor of no mean influence on the balance of naval power. The *Yavouz Sultan Selim*—such is the present name of the ex-flagship of Admiral Souchon—is practically a new ship, thoroughly sound in the matter of hull and propelling machinery, and up to date also in the matter of equipment. She has in front of her an active life estimated at some fifteen years. Her bona fide sea speed, in the course of several tests in the Sea of Marmora and in the Middle Sea, has proved to be superior to twenty-six knots—which means that she is vastly superior to anything of the same speed and power combined in the Middle Sea and, strategically, much in the position that was hers when she defied the pursuit of the combined English and French squadrons. German *ingenieurs*, representatives of the builders have had at heart, by working in coöperation with French specialists from St. Nazaire, to modernize as much as possible that famous German *Schlacht Kreuzer* and to render her fit for the ordeal of warfare under the changed conditions of today and tomorrow, especially in regard to aerö-chemical warfare. Turkish officers of the new post-revolution generation, who are intensely patriotic, not to say chauvinistic, are extremely proud of their renovated battle-cruiser, that is capable in a light condition, of reaching thirty knots, and which they proclaim to be "the queen of Levantine waters"—which she is at least so long as the British *Hood*, *Renowns*, and *Tiger* are kept in the channel or Atlantic.

JAPAN

The Maya

New York *Times*, November 7.—The *Maya*, next to the last of the 10,000-ton cruisers which Japan may build within the limitations of the London Naval Treaty, is to be launched at the Kawasaki dockyard here Saturday.

Of the twelve vessels making up the 108,400 tons of first-class cruisers, or those carrying 8-inch guns, permitted to Japan by the London agreement, only the *Chokai*, now under construction in the Mitsubishi dockyard at Nagasaki, remains to take the water after the *Maya*.

Eight of these twelve ships are completed and in commission—four of 7,100 tons each, the *Furutaka*, *Aoba*, *Kako* and *Kinukasa*, and four of 10,000 tons each, the *Nachi*, *Myoko*, *Haguro* and *Ashigara*. The ninth and tenth were launched earlier.

MERCHANT MARINE

Foreign Built Vessels for American Companies

Merchant and Marine Bulletin, November.—In an article recently prepared, the National Council of American Shipbuilders discusses shipbuilding costs (see table below).

The foreign press has devoted much space of late to comment on the awards to German and Italian shipyards for the construction of nine large oil-carrying vessels for one of our largest American oil companies. German and Italian papers are jubilant over receiving these orders at a time when the shipbuilding industry is seriously depressed

WAGES PER HOUR

Trade	*United States*	*Great Britain*	*Germany*	*Italy*
Blacksmith	$0.70	$0.305	$0.219	$0.199
Carpenter (ship)	0.71	0.306	0.219	0.194
Coppersmith	0.79	0.317	0.219	0.199
Electrician	0.70	0.328	0.219	0.199
Joiner	0.71	0.310	0.219	0.175
Machinist	0.71	0.315	0.219	0.185
Patternmaker	0.84	0.346	0.219	.....
Pipefitter	0.71	0.305	0.219	0.204
Sheet metal worker	0.69	0.309	0.219	0.175
Shipfitter	0.71	0.305	0.219	0.194

in each of those countries. Great Britain deplores the loss of this business to her shipyards and has indulged in much discussion as to how it is possible for continental yards to build ships cheaper than in her yards. If the press reports be true these contracts were taken at about $77 a deadweight ton in Germany and at $66 a deadweight ton in Italy, while British prices are stated to have been from $3 to $9 a ton higher than the German quotations, or from $80 to $86 a deadweight ton. These prices are, of course, very much less than prices in the United States for the construction of vessels of this type. American quotations for the same vessels would be not less than $135 a deadweight ton.

These vessels are to engage in foreign trade, in competition with foreign-owned vessels, and the owners cannot be blamed for placing these contracts abroad where these vessels can be purchased at so much lower figures, nevertheless, as we are passing through an era of business depression in this country, with considerable unemployment, it is regrettable that these vessels could not have been built in the United States. Our shipbuilding facilities are ample and at the present time only about one-third of our total building ways are in operation.

In addition to the nine vessels alluded to there are at least seven other oil-carrying vessels building abroad for American companies, three in Great Britain, three in Germany, and one in Italy, sixteen in all, at an approximate cost, if built in this country, of $34,500,000, which would have given employment to about 18,400 men for one year at a time when they needed it—one-half of them in our shipyards and the other half in the many allied industries that furnish materials and equipment.

The reason, of course, for the much greater cost of ship construction in the United States is the higher wage paid in this country and which must be paid to enable our workmen to conform to our superior standards of living which should be maintained. Wages, nevertheless, which are established by our protected industries and which must be paid by shipbuilders although their industry is not a protected one.

The tabular statement in another column shows the wages paid in some of the most important shipyard trades in the United States, Great Britain, Germany, and Italy, also the prices paid by the wage earner in these respective countries for some of the staple food commodities as ascertained by the *International Labor Review* of April, 1930.

These tables show that wages in the United States are about double those in Great Britain; triple those paid in Germany, and about three and one-half times those paid in Italy. Food prices, however, do not show any such difference. In fact some of the principal food supplies are even higher in those countries than in the United States.

On the basis of weekly rations, provisions allowed and served out per week for a member of a crew of a merchant vessel, which should represent approximately the food requirements for a wage earner, the relative cost of weekly ration, using the United States as unity, would be in Great Britain .74, Germany .81, and Italy .85, which is out of all proportion to the relative wage rates.

It is evident, therefore, that the lower cost of ship construction in those European countries is due to a lower standard of living than that which exists in the United States. No one would wish to see our standards of living reduced, but may it not be well to shape our shipping policy so that our important American shipping companies can

STAPLE FOOD COMMODITIES

Article	*Unit*	*United States*	*Great Britain*	*Germany*	*Italy*
Bread	Kilogram	$0.192	$0.102	$0.1928	$0.1046
Butter (fresh)	Kilogram	1.147	1.022	0.9663	1.0210
Beef	Kilogram	0.834	0.768	0.5736	0.7075
Coffee	Kilogram	0.979	1.208	1.5494	1.5696
Tea	Kilogram	1.621	0 974	2.2848	.....
Cheese	Kilogram	0.858	0.600	0.4593	1.0436
Potatoes	Kilogram	0.086	0.040	0.0262	0.0416
Sugar	Kilogram	0.136	0.128	0.1476	0.3582
Milk	Litre	0.125	0.122	0.0690	0.0710
Eggs	One	0.053	0.058	0.0428	0.0358

Conversion rates: Great Britain, 1 pence—2 cents; Germany, 1 mark—23.8 cents; Italy, 1 lire —5.26 cents.

afford to build their cargo-carrying vessels for foreign trade here. The cost is about 50 per cent greater than in Great Britain. We have not hesitated to provide protection of even more than 50 per cent for the development of many of our internal industries, why not provide similar protection for shipbuilding as it is a factor in the promotion of the welfare of all of our industries through the creation and development of our foreign markets?

Lloyd's Register Annual Report

The Marine Engineer and Motorship Builder, November, 1930.—Some interesting statistics relating to the trend of propelling machinery developments as shown by the report of Lloyd's *Register of Shipping* for the year ended June 30, 1930.

We comment editorially on the recently issued annual report of Lloyd's *Register of Shipping,* which reviews the operations of the society for the year ended June 30, 1930. Three facts in connection with the development of international shipping call for special notice, viz., the large volume of tonnage built to class with the society; the large proportion of that tonnage built for the carriage of oil and other commodities in tanks, and the continued increase in the demand for internal-combustion engines, especially in the new tanker tonnage.

The table given above, compiled from the society's records and from the statistics, which form such an interesting and valuable section of Lloyd's register book, shows the relative proportions of (i) reciprocating steam engines, (ii) steam turbines, (iii) motors, fitted in vessels built to class during recent years. It also serves to illustrate the motive power used, showing the proportion of tonnage propelled: (*a*) by use of coal; and (*b*) by use of oil, i.e., as fuel for boilers or motors. (A number of these vessels can, however, burn either coal or oil in the furnaces of their boilers.)

The second table, embracing all existing vessels of 100 tons and upwards, as recorded in Lloyd's register book, is appended to emphasize the continued increase in motor ton-

Year	*Total steam and motor tonnage classed (including auxiliaries)*	*Type of Engines*			*Fuel*			
		Steam reciprocating	Steam turbines	Motors	Coal		Oil	
	Tons gross	Tons gross	Tons gross	Tons gross	Tons gross	Per cent	Tons gross	Per cent
1918–19.....	3,760,806	2,633,570	1,051,302	75,934	2,491,213	66.2	1,269,593	33.8
1919–20.....	4,186,882	2,821,031	1,286,046 (all geared)	79,805	2,111,289	50.4	2,075,593	49.6
1920–21.....	3,229,188	2,373,067	754,513 (all geared)	101,608	1,260,465	39.0	1,968,723	61.0
1921–22.....	2,517,513	1,420,924	870,037 (all geared)	226,552	895,032	35.5	1,622,481	64.5
1922–23.....	1,610,624	842,358	603,037 (all geared)	165,229	662,565	41.1	948,059	58.9
1923–24.....	874,651	610,851	99,464 (all geared but one)	164,336	468,153	53.5	406,498	46.5
1924–25.....	1,311,277	894,807	114,009 (all geared)	302,461	671,405	51.2	639,872	48.8
1925–26.....	1,324,789	575,984	146,354 (all geared)	602,451	418,503	31.6	906,086	68.4
1926–27.....	967,062	405,280	168,557 (all geared)	393,225	297,948	30.8	669,114	69.2
1927–28.....	1,875,068	853,613	209,018 (all geared but one)	812,437	631,240	33.7	1,243,828	66.3
1928–29.....	1,737,736	784,046	167,337 (all geared but one)	786,353	600,270	34.5	1,137,466	65.5
1929–30.....	1,804,246	856,357	100,486 (all geared)	847,403	680,699	37.7	1,123,547	62.3

Year	Total steamer and motor tonnage (including auxiliaries)	Type of Engines			Fuel			
		Steam reciprocating	Steam turbines	Motors	Coal		Oil	
	Tons gross	Tons gross	Tons gross	Tons gross	Tons gross	Per cent	Tons gross	Per cent
1922...	61,342,952	51,653,324	8,149,165	1,540,463	45,338,327	73.9	16,004,625	26.1
1923...	62,335,373	51,775,239	8,893,749	1,666,385	44,876,570	71.9	17,458,803	28.1
1924...	61,514,140	50,742,758	8,795,584	1,975,798	42,384,270	68.9	19,129,870	31.1
1925...	62,380,376	50,566,029	9,100,274	2,714,073	41,862,181	67.1	20,518,195	32.9
1926...	62,671,937	50,040,978	9,137,675	3,493,284	40,935,114	65.3	21,736,823	34.7
1927...	63,267,302	49,767,495	9,228,983	4,270,824	40,514,719	64.0	22,752,583	36.0
1928...	65,159,413	50,045,048	9,682,063	5,432,302	40,674,097	62.4	24,485,316	37.6
1929...	66,407,393	50,573,689	9,205,602	6,628,102	40,358,396	60.8	26,048,997	39.2
1930...	68,023,804	50,780,877	9,146,590	8,096,337	40,069,679	58.9	27,954,125	41.1

NOTE.—Vessels fitted with a combination of reciprocating and turbine machinery are now included under the heading of "Steam reciprocating"; prior to 1929 they were included under "Steam turbines."

nage, and attention is at the same time drawn to the fact that, in the current year, the tonnage of vessels using oil as fuel, either in motorships or steamers, has for the first time reached over 40 per cent of the total tonnage.

Interesting features in connection with marine propulsion observed during the course of the year in the proposals submitted for the consideration of the committee have been:

(1) The tendency towards the use of high-pressure steam, up to about 450 pounds per square inch, water-tube boilers being employed for this purpose.

(2) The employment of higher mean indicated pressures, obtained by supercharging, in Diesel oil engines of the four-stroke cycle single-acting type.

(3) The increased use of double-acting oil engines of both four- and two-stroke cycle type.

The total number of vessels fitted with steam turbines, classed by the society during the year, amounted to thirteen, of 100,486 tons. In one vessel, the SS. *Santa Clara,* 9,373 tons, the turbo-electric drive is employed, but in the remainder the turbines are used in conjunction with reduction gearing. The turbo-electric drive is also being employed in three large vessels now under construction to the society's class, viz., twin-screw *Strathaird,* 21,500 tons, twin-screw *Strathnaver,* 21,500 tons, and the quadruple-screw *Mid-Ocean,* 17,500 tons. The Bauer-Wach system of connecting an exhaust-steam turbine to the main shafting of steam reciprocating engines by mechanical gearing and hydraulic clutch has been adopted in nine new vessels, of 45,430 tons, classed by the society during the period under review, and the satisfactory performance of vessels in commission thus equipped has led to a further number of existing steam reciprocating engines being converted to this system.

In another new vessel, the SS. *City of Barcelona,* 5,698 tons, fitted with steam reciprocating engines, an exhaust-steam turbine drives a directly coupled electric generator, which supplies power to a motor.

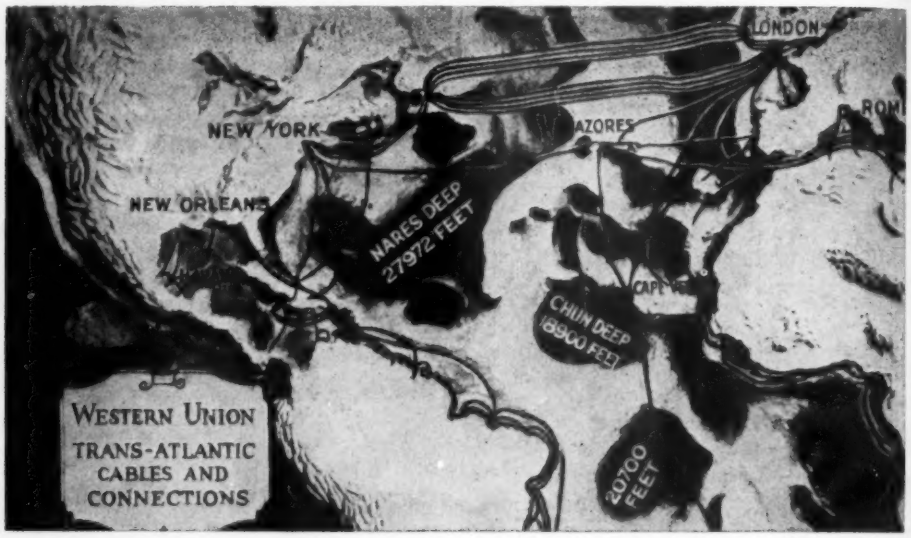
Among the vessels classed by the society during the year, sixty-one steamers of 276,144 tons were fitted for the use of oil fuel, i.e., 29 per cent of the *steamer* tonnage built to class in that period.

ENGINEERING

Submarine Cables

The Western Society of Engineers, October.—It was only a few years back, in 1924, that the Western Union laid its first high speed or "loaded" cable.

Fig. 1 is a drawing showing the construction of a "loaded" cable, which is typical of the type the Western Union has laid recently. The conductor consists of a copper wire a little over one-eighth inch in diameter, over which are wound five thin copper tapes. This construction is used instead of stranded conductors, because it has been found that the construction was more compact and the lower electrostatic capacity was obtained thereby, permitting faster working.



Over the copper tapes is wound a "permalloy" tape, .005 in. thick and .08 in. wide. The permalloy is an especially alloyed metal composed of iron and nickel. This permalloy tape acts to increase the inductance, which counteracts the effect of the electro-static capacity, thereby permitting the sending of signals more rapidly and consequently increasing the speed of operation.

Over the permalloy tape is placed a covering of gutta-percha, which insulates the conductor. Next is applied a layer of jute yarn as a cushion for the galvanized armor wires which are next applied. Another layer of jute is applied as a further protection. The overall diameter of the deep sea section of the cable is about one inch. As the water becomes more shallow, heavier construction is used. The final shore end is almost three inches in diameter. The copper conductor, however, is of uniform diameter throughout, the increase in weight and bulk being in the protective armor.

The first high-speed cable was laid in 1924 between New York and the Azores, that group of islands 800 miles west of Portugal. The second, in 1926, consisted of two sections, one between New York and Newfoundland, and the other section between Newfoundland and England. These cables are operated in only one direction at a time. A third cable was laid in 1928 between Newfoundland and the Azores.

In the 1928 cable "mumetal" was used for loading. This is an alloy of nickel and iron similar to permalloy. In this cable the middle sections were heavily treated with mumetal, the loading being diminished

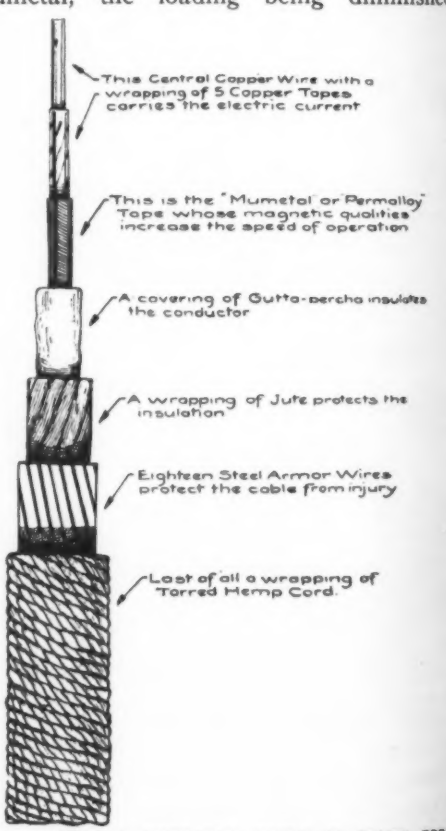

This Central Copper Wire with a wrapping of 5 Copper Tapes carries the electric current
This is the "Mumetal or Permalloy" Tape whose magnetic qualities increase the speed of operation
A covering of Gutta-percha insulates the conductor
A wrapping of Jute protects the insulation
Eighteen Steel Armor Wires protect the cable from injury
Last of all a wrapping of Tarred Hemp Cord.

FIG. 1. HOW A DEEP SEA CABLE IS MADE FOR HIGH SPEED TELEGRAPH USE

towards the ends and the final 160 miles at either terminal was not loaded at all. This graduation of loading was made in order that the cable could be operated duplex, thereby increasing the capacity, and facilitating handling of rush traffic.

The 1924 and 1926 cables have capacities of about 1,500 and 2,500 letters per minute respectively. The 1928 cable has a capacity of 2,100 when operated in one direction only, and a duplex capacity of more than 2,800 letters per minute. The loaded cables thus have a capacity of five or more times that of the old non-loaded type.

The combined length of the new type loaded cable installed by the Western Union in the last five years is over 7,000 nautical miles, the longest section being over 2,300 miles.

Cable traffic more than doubled between 1913 and 1927. The figures for the Western Union alone were 38,000,000 words in 1913 compared to 93,000,000 words in 1927.

The operation of the loaded cables is somewhat similar to that of the multi-plex, except that we have more delicate signals to deal with, necessitating the use of apparatus capable of responding to very minute currents and of very close adjustments.

The Dardelet Self-Locking Screw Thread

Referring to the item on the Dardelet Self-Locking Screw Thread in the November issue, the editor has been informed that the Dardelet screw thread products are handled in this country by the Dardelet Threadlock Corporation of New York City.

AVIATION

The Cairo-Cape Town Air Route

New York *Times*, November 9.—Less than thirty years ago a gun carriage, drawn by straining horses, bore the body of Cecil Rhodes to its last resting place amid the rocky summits of the Matopo Hills, near Bulawayo. Within a few months airplanes, flying on schedule and carrying passengers from the Cape to Cairo, will cast the shadow of their wings upon his grave. The African Empire which was the dream of Rhodes will be knit together by an airline that will bring Cairo within eight days of Cape Town, 5,700 miles away, and London only eleven days from Table Mountain. Despite the progress in colonization and transportation in the seventy years since the era of "Darkest Africa" and the days of Burton, Livingstone, and Stanley; despite the work of Rhodes himself in driving a railroad up the backbone of a continent, it will remain for the airplane to close the existing gaps of communication and make possible an unbroken journey from end to end of that unique jumble of colonies and mandates, states, and protectorates which is Africa.

It would be hard to imagine a more varied or more romantic terrain than that which will unroll itself beneath the traveler on the modern magic carpet of flight. From Cairo eighteen-passenger landplanes will take him to Khartoum, where the ivory and ostrich feathers of the Sudan come to market. Thence up the broad Nile and across Lake Victoria, fifteen-passenger flying boats will bear him above one of the great river valleys of the world to Mwanza, and a little later, when ground organizations have been further developed, to Kisumu on the shores of the lake. This will be the terminus of the first leg of the transcontinental line to be opened to the public in January. Four days of flying by daylight, with tea at airdromes and night stops at Assuan, Khartoum, and Juba, will account for 2,620 miles.

From Kisumu, a few months later, the rest of the far-flung route will be opened to the Cape. The passenger, switched once more to fourteen-passenger landplanes, will fly above the termini of the Kenya railways and cross many of the main arteries of travel which run from east to west rather than from north to south. All the way to Broken Hill, in Northern Rhodesia, a distance as great as that from New York to Miami, the airline will be the only north and south route in regular operation. The air traveler will follow the highlands, a course selected for both flying and commercial reasons, and will lunch, the fifth day out, at Moshi, near the slope of Kilimanjaro, towering 19,000 feet into the blue. Mbyea will mark the night stop of the fifth day out from Cairo, after a flight over the sisal plantations of Tanganyika. The next day Northern Rhodesia will pass under his wings and the night find him at Salisbury, across the huge Zambezi. It will be on the seventh day of flight to the south that he will pass above the Rhodes cenotaph as he heads for Johannesburg, while a final jour-

ney of 825 miles will bring him to Table Mountain and a landing at the new airdrome of Cape Town.

What unbelieving eyes would the African traveler of even a quarter-century ago have rubbed at the thought of a "trek" of nearly 6,000 miles in eight days! The Cape-to-Cairo airline of Imperial Airways should write a new and inspiring chapter in air transport.

Aviation Training in Germany

New York *Times,* November 9. By John Graudenz.—Besides the Hindenburg slogan, *Ordnung muss sein,* which of late has become world famous, there is another proverb more typical of the German character, *Die deutsche Gründlichkeit,* or thoroughness.

This thoroughness is the basis of the methods applied by the "Deutsche Verkehrsflieger Schule," or German transport pilots school, known as the D.V.S., in training commercial pilots for land- and seaplanes. The school is a limited liability company of which the German Ministry of Transportation and the Deutsche Lufthansa are the sole shareholders. It receives an annual subsidy from the Reich of about $550,000. The managers of the school, one of whom, Wolfgang von Gronau, recently flew successfully via Iceland, Greenland and Newfoundland to America, declare that the expenses involved in maintaining a sufficiently large number of land- and seaplanes, including several multi-engined flying boats, does not permit a private school to give its students the thorough all-round training which the D.V.S. is able to afford. The courses are three years for pilots of landplanes and four years for seaplane pilots.

Besides some fifty land- and seaplanes and sea craft, beginning with small rowing boats and ending with seagoing vessels, the school not only possesses all the modern instruments for nautical and meteorological observation, for blind flying and other equipment required in aviation, but is able to boast a wireless station of its own.

The headquarters of the school are at Braunschweig, in Western Germany, with branches at Schleissheim, near Munich, Bavaria, and seaports at Warnemuende and List on the Isle of Sylt in the North Sea.

Although the courses involve considerable expenses for the students, the number of applicants is more than 1,000 every year. Only twenty to twenty-five are accepted. The students, accepted at from eighteen to twenty-six years, must have passed high-school graduation examinations. They must have the bronze medal awarded to gymnasts and athletes, have a speaking knowledge of English or Spanish and be generally fit, physically and mentally. The boys are submitted to special physical examination and to psychotechnical tests prepared from the viewpoint of aviation. The students pay about $40 a month for full board and training fees. Of this amount $5.00 is refunded for pocket money to purchase cigarettes, stamps, and soft drinks, alcohol not being permitted on the premises.

During the first eighteen months the training is identical for both groups. It begins at Braunschweig, where the students remain four weeks. By the middle of April the young men go to the yacht school at Neustadt, near Luebeck, for five months, where they receive practical training in seamanship, which includes trips to the three Scandinavian countries, to Danzig, and Finland. During this time the students live a regular sailor's life, with all its hardships. Here they also receive the fundamentals in navigation and radio, and at the end of the five months they pass an examination.

October 1 they return to Braunschweig or Schleissheim, where they remain six months, of which three are devoted to the workshops and three to actual flying with landplanes in preparation for the "A" license, which corresponds to the American private license. The student must also have had thirty hours of flying time, a climb of about 6,000 feet, where he must remain for an hour, and make three spot landings within a limited area of 800 by 160 feet. Further requirements are two cross-country trips covering about sixty-five miles and one cross-country flight of about 185 miles, during which he must make two landings at airdromes marked on a map handed to him just before starting. Finally, the student must make a dead-stick landing without using the throttle from an altitude of about 3,000 feet, fly over the field at a height of 1,500 feet, close the throttle at a signal of a pistol shot fired from the ground and make a spot landing, a maneuver necessary in case

of motor trouble. The planes used for this training are of the Flamingo type.

On April 1, after nearly thirteen months have expired, the students start on a cross-country trip leading through all Germany to acquaint them with German flying fields. The trip, which lasts two months and covers over 3,000 miles, is made in all kinds of weather and flying conditions. At the same time the students are taught stunt flying.

At the beginning of June all students shift over to Warnemuende, which is the only German base with a combined land- and sea-plane airdrome. It has a large landing field and large inland lake separated from the sea and a concrete runway to the open sea.

Here the students make twenty flights on seaplanes with instructors and thirty solo flights, three spot landings on the lake where a space of the same size as on the landing field is marked off by buoys and three landings in the open sea during a sea of force two. After each landing they must stop the motor, drop a sea anchor, restart the motor and take off again. An over-sea flight of about fifty miles and two landings at given places complete the course, after which the student receives "A" license for seaplanes. Up to this time the student has made 100 flights all told.

At the beginning of the third year the seaplane pilots go to List on the Isle of Sylt, North Sea, which is the most northwesterly point of Germany, where training begins on larger, low-winged seaplanes, which takes all summer. The flights, which cover about 6,000 miles, include trips to England, Norway, and Dutch islands. During these trips the students receive practical courses in radio operation and navigation, which on the North Sea is more difficult than on the Baltic. By the end of this summer the students are sent to the Lufthansa for practical flying as second pilots in passenger planes for a period of from four to six weeks, during which they cover about 6,000 more miles.

Six round trips on steamers running between Warnemuende and Denmark with the students at the wheel by day and night to get used to practical navigation before they start to navigate seaplanes also are obligatory. This is again followed by over-sea flights with larger seaplanes fitted with radio direction finders. After passing a final examination in motor knowledge, aërodynamics, meteorology and other requirements, the students receives the full "B" license, which entitles him to carry passengers in seaplanes.

Then the students return once more to List to begin training for the "C" license, which corresponds to the American transport license. The students here cover about 8,000 miles with large flying boats of the Dornier, Junkers, and Heinckel types.

Before he receives the "C" license the student must fly another 5,000 miles with traffic planes.

New British Flying Boat

Aëroplane, October 15.—The latest Short boat seaplane is being built to a specification which has been issued by Imperial Airways, Ltd., as a result of their experience in the Mediterranean. One would therefore expect such a boat to be just about the last word in boat-seaplane design.

The new boat is a four-engined version of the Short *Calcuttas* which have been giving such a good account of themselves on the Salonika to Alexandria stage of the air route to India. Perhaps the most interesting innovation is the fitting of a stainless-steel bottom to the newest boat. This has already been successfully done to one of the latest Short machines, the *Singapore Mk. II.*

A bottom of such material, when it is extended to well above the water line, removes the necessity for frequent inspection which is required if a duralumin sheet is used. There is interest in noting that the real difficulty in coping with corrosion of duralumin bottoms is not preventing the sheets from being affected, but the rivets. The closing up of the rivets by the hammer spoils the protective film, and makes them nuclei for the formation of corrosion. Stainless steel rivets used with stainless sheet do not give this trouble.

Another point of difference is that the pilot's cockpit is completely enclosed. There is a crew of three and accommodation for sixteen passengers, chairs for whom are arranged in rows of four. Between the compartment for the radio operator and the cabin is a compartment, with a capacity of 1,600 kgs. (3,530 lbs.), for the transport of mails. The lavatory accommodation and baggage space will be as completely adequate as they were on the *Calcuttas*.

There will be special fittings on the hull so that the machine can be towed behind a ship. Another novelty will be the fitting of a quick-release hook at the stern so that the engines may be run up while the machine is moored to a buoy, and the machine can be let go with engines fully alive.

The engines will be four Bristol Jupiter X.F.B.M., geared, air-cooled, radials, arranged in four nacelles between the wings. These engines are moderately supercharged up to 5,000 ft., so the new flying boat will have its best performance at this height. Arrangements will be made for the complete refueling of both tanks from one fitting on the hull.

The weight of the machine empty, inclusive of cabin equipment, will be 17,900 lbs., the disposable load will be 12,410 lbs., and the weight loaded 30,310 lbs. (13½ tons). The estimated top speed is 132 m.p.h. at 5,000 ft., the cruising speed at that height is 100 m.p.h., and the landing speed 60 m.p.h.

Imperial Airways, Ltd., seem to have insisted on this type so that they may use the same type of engine throughout their system. Otherwise a machine with four radial engines, each head-on to the air, cannot compare for performance with one like the Short *Singapore Mk. II,* with its four Vee-type engines in tandem pairs. The reason seems to be inadequate when we consider that speed is the essence of the contract in an air mail service.

The Air Ministry's Future

Army, Navy, and Air Force Gazette, October 30.—At a singularly inopportune moment, when the minds of the authorities are occupied with matters of much more immediate importance to the development of aviation and the efficiency of the Royal Air Force, certain newspapers have felt it incumbent upon them to attack the present system of a separate air ministry and to call for the abolition of a department which they represent as redundant. There may be, and in fact there are, strong arguments which can be advanced in favor of the Navy and Army resuming direct control of the production as well as the operation of the aircraft required for their own purposes, and of the handing over of the control of civil aviation to the ministry of transport. But there are equally strong arguments to be heard in favor of the existing plan, which only last year was copied in France. A battle royal is therefore certain if the issue is forced into the realm of practical politics, and in view of the uncertainty which would be created, and the distraction that would be caused, whether or not any change was made, it is obvious that such a controversy ought not to be entered into at the present time. The position, after all, has not materially changed since 1923, when it was the subject of cabinet investigation, and the principle of a single air service was then firmly upheld. It is far better to allow the existing organization to continue, since it is working reasonably well, until such a time as it can be reviewed more calmly in the light of further experience, and when those who may be called upon to decide are not encumbered with memories of past controversies and prejudices.

New Airplane Propeller Construction Methods

Aviation, November. By Lieut. L. D. Webb, U. S. Navy.—Recent propeller development has as its incentive the desirability of reducing the weight of present propeller assemblies and the possibility of improving both strength and efficiency. This effort has taken two logical but decidedly divergent paths. One method seeks to reduce weight and centrifugal stress through the employment of lighter alloys; the other accomplishes the same result with hollow blade construction fabricated from high strength alloy steel.

The alloys of magnesium offer considerable promise in the reduction of propeller weights, as the specific gravity of the material is about 1.80 as compared to 2.80 for the present aluminum alloy blades. The magnesium alloy which now appears best suited for propeller use consists of approximately 96.6 per cent magnesium, 4 per cent aluminum and 0.4 per cent manganese. This alloy has demonstrated an ultimate strength varying from 38,000-40,000 lb. sq. in. in the forged condition. The elongation under these conditions is from 15 to 20 per cent and the alloy has a fatigue limit for propeller use of about 11,000 lbs. per sq. in.

Several experimental propellers of this material are now under construction at the

plant of the Hamilton Standard Propeller Company for the Bureau of Aëronautics of the Navy Department and when completed will be used in extensive service tests to establish definitely the advantages or disadvantages of the material for propeller service. A propeller of this type designed for the 225 hp. Wright Whirlwind engine, weighs 52 lbs. complete with hub. A similar aluminum alloy propeller assembly for the same engine using alloy blades and a steel hub weighs 78 lbs.

The experimental blades of this design were produced from billets which were alloyed, cast and heat treated. They were then machined all over and subjected to X-ray inspection. Following the inspection the sound billets were extruded to a diameter slightly greater than the largest shoulder on the end of the blade. They were then re-extruded to a form from which the blade sections could be pressed and the end of the extruded blank was left in the press to form the shoulder at the hub. After extruding, various portions of the blades were pressed out in a series of operations to form a rough blank from which the propeller blade could be machined. These blanks were then roughed to size on a special type of duplicating machine and finished by grinding and polishing.

The magnesium alloy propellers have so far been made for a new type of hub for which the inner ends of the blades are made hollow, resulting in a semi-hollow propeller, combining the advantage of the solid forged blade with the saving in weight possible with a hollow inner portion.

This hub is made up of a spider which fits onto the engine shaft and which is provided with two tapered extensions. A taper of one in six is used as it has been found that this taper gives a very tight drive, but will not seize. The inner ends of the blades are provided with a conically tapered bore, which fits accurately on the taper of the hub extensions. This provides for the drive of the propeller and the centrifugal force is taken by a short split hub member which extends beyond the two shoulders. The blades and hubs are machined so as to give a shrink fit of about .003 in. on the tapers. The propellers may be assembled by heating the ends of the blades in boiling water so that they go together freely and draw up tight on cooling, or they may be assembled by tapping the ends of the blades to drive them up onto the ends of the taper.

Governmental air services require that all radically new propeller designs be thoroughly proven by "whirl testing" prior to actual approval of the design for flight purposes. A sample magnesium alloy propeller of the type described herein was accordingly subjected to the whirl test, and after successfully passing the minimum requirement of ten hours of 450 hp. was successively tested by one hour runs at 100 hp., increasing the power until 1,200 hp. was reached. It was then run for 10 hrs. each, at 900, 1,000, and 1,200 hp. without failure. It was finally run one hour each at 1300, 1,400, 1,500, and 1,600, hp. At the end of the 1,600 hp. run a small crack had appeared in one blade which had its origin in a dent caused by a mechanical injury. This would have led to failure in further running and the test was therefore discontinued. As a result of this test it may be said that the magnesium alloy blades of this particular design have ample strength to withstand any normal centrifugal stresses.

Although the whirl test with its strenuous loading, can probably be accepted as adequate proof of propeller strength, a new design involving a change in material is usually run on an engine test-stand for a considerable period before using it in flight. The object of this phase of the test is to establish that the propeller will withstand successfully the widely varying stresses encountered with certain "rough running" engines. There have been numerous instances where a propeller has passed a whirl test at high loading and a similar blade has failed in the course of an engine test conducted at a far lower output. Failures of this nature are due to fatigue conditions in the metal, developed by rough running.

Two widely different types of hollow steel blades have completed an entirely satisfactory whirl test similar to that described in the discussion of magnesium blades. One of these types has had an appreciable amount of satisfactory flight testing. The other is now in the process of exhaustive engine stand and flight tests. A third type is under development at the plant of a large manufacturing corporation.

All of these hollow steel blades are fabricated from high strength alloy steels, one

type using a chrome vanadium S.A.E. No. 6130 steel, another a chrome molybdenum steel. The ultimate tensile strength and the fatigue limit of propeller blades built of these materials are of the order of 100,000 and 50,000 lbs. per sq. in. respectively, as compared with the corresponding values of 55,000 and 12,500 lbs. per sq. in. respectively for aluminum alloy blades. Since the material can be placed where it is most needed, the weight handicap due to the use of steel can be readily overcome and present experimental hollow steel propellers in this respect compare favorably with standard aluminum alloy blades even when the steel blades are used with the standard type of hub now in general service. One of the great weight saving features of the hollow steel type of propeller construction is the fact that radically new hub designs weighing far less than the present standard types may be used without sacrificing strength. The weight reduction of this character which is already in sight will range from 20 to 50 lbs. on propellers of varied service sizes.

It is hoped, and confidently expected, that the hollow steel type of blade construction will to a large extent eliminate the troublesome pitting and erosion now encountered in seaplane service with aluminum alloy blades. Spray tests conducted some time ago by the Bureau of Aëronautics with various materials inserted in the leading edge of alloy blades indicated that the alloy steels had the best spray resisting qualities of the materials tested. Flight tests of the hollow steel blades under severe seaplane operating conditions are now in progress and will be continued for an indefinite period.

The Fleet Air Arm

Aëroplane, November 5.—The Fleet Air Arm, Royal Air Force, took part in the display given by the Atlantic Fleet off Portland on November 1 for the dominion premiers. Coast defence was represented by a formation of supermarine Southampton flying boats of No. 201 (flying boat) squadron, which flew from Calshot alighted off Portland and thereafter circled the flagship from which the premiers were watching the display.

During the afternoon the aircraft borne in H.M.S. *Courageous* flew off her deck and, after picking up formation, flew past the flagship. Visibility was so bad that a number of the thirty or so machines which had flown off the deck had to alight on shore. One of the fleet spotter reconnaissance machines suffering from engine trouble came down in the water and turned over. Within a few minutes the crew were rescued and the airplane sank.

The R.A.F. units in H.M.S. *Courageous* include three fleet fighter flights, four fleet spotter reconnaissance flights, and two fleet torpedo bomber flights. The senior air force officer is Wing Commander R. Collishaw, D.S.O., O.B.E., D.S.C., D.F.C.*

Navy Views on Low-Wing Monoplane Type

New York *Herald Tribune,* November 16.—Though they speed Captain Frank Hawks and Colonel Charles A. Lindbergh to new records, low-wing monoplanes, which are revolutionizing commercial aviation, seem destined to be passed up by the Navy.

Watching with interest the performances of this new-type ship, Navy engineers and design experts are standing pat on a decision reached some years ago, the design division of the Bureau of Aëronautics said today, and will make no attempt at present to change from the biplane, which has been so satisfactory for a long time.

Several apparent disadvantages, in the opinion of Navy designers, bar the monoplane for the present, the most important being that they are not capable of carrying the loads or standing the strains required by service operations. While they perform satisfactorily enough in record flights and have sufficient lifting power to carry small loads of mail or express, these ships, the Navy feels, cannot be expected to maintain their speed when loaded down with machine guns, radio apparatus and additional personnel.

Biplanes still hold favor because they are more compact and can be stowed away better on carriers, cruisers and battleships. To make the change in type of planes would require reducing the size of the squadrons

* NOTE—When the *Courageous* was placed in commission as an aircraft carrier on January 1, 1928, the assigned complement of aircraft units was: 1 fighting flight, 2 fleet spotter reconnaissance flights, and 2 torpedo bomber flights. The *Courageous* displaces 18,600 tons.

assigned to various Navy craft and, theoretically, weaken the air arm of the service.

"It would be necessary to have a greater wing span were we to load down monoplanes with the equipment our biplanes carry," one naval aviator and designer explained. "That would mean we couldn't accommodate as many planes on a carrier or cruiser, for the flight deck as well as the hangar space is severely limited."

Increasing the wing span, this officer added, would increase the hazard in operating from decks of the carriers. The biplanes have been designed to provide the best possible visibility for the crew, he said, and can be landed safely because of this feature as well as because they can operate from a narrower stretch of deck.

The possibility that monoplanes with folding wings could replace biplanes has been considered and discarded. Dissatisfaction with folding-wing planes is widespread and the chance that such an arrangement might be made is remote.

The high-speed feature of the low-wing ships might not be an advantage in Navy aviation, the design division declared.

Relative strength, too, is a factor which the Navy considers gives the biplane an unquestionable advantage. Subjected to all kinds of flight tests, biplanes have been designed for the particular uses to which the Navy puts them and have a factor of safety beyond that of any common commercial ship. The demands of service aviation, which requires power, dives with heavy loads as well as the ability to stunt, would require expensive experimentation to reach a design embodying the necessary structural features.

The Navy does not speak without good authority, it was explained at the design division of the bureau, for although it is watching from the sidelines at present it has had experience with monoplanes in former years. Low-wing monoplanes were introduced into naval aviation ten years ago, records show, and for several years a few planes of this type were used extensively.

MISCELLANEOUS

The Freedom of the Seas

Naval and Military Record, November 5. By Sir Herbert Russell.—"Navy Day" has recently been celebrated in the United States. In his message apropos of the occasion the Secretary of the Navy expressed the hope that the event would bring home to the American people a better understanding of what their Navy means to them and its relation to that great element of prosperity which lies in their ocean commerce. An excellent, statesmanlike message, and interesting to us on this side of the Atlantic since it sheds illumination upon a subject which rather puzzles us why the United States, at this pacific juncture in history, is so insistently demanding the rapid creation of what we recognize she intends to be the most powerful war fleet in the world. She has an immense and rapidly expanding oceanic trade, and, although she cannot profess to believe that any threat to her sea commerce exists anywhere today, she is resolved that it never shall exist for want of the power to counter it. Would that there were a more general sentiment to the same purpose in this country.

But the message of the Secretary inevitably leads us into reflections which go much beyond its bare purport. By an easy and natural association of ideas it carries us on to the subject of the freedom of the seas, a doctrine to which America is very much wedded. There was some relief at the fact that, contrary to wide expectation, this matter was not raised in any shape or form by the United States delegation to the London naval conference. That it will be raised in the not distant future, however, is pretty certain. America is very dissatisfied with the present state of international law as it affects the rights of neutrals—or perhaps I should say what she regards as the rights of neutrals. As her Navy grows relatively stronger so will her voice grow louder upon this subject. President Wilson gave the cue when, in his list of "points" as a basis for peace terms, he laid down the freedom of neutral nations to continue trading as usual during other people's wars. It was not difficult to trace the origin of this demand. The activity of the British Navy in trying to arrest the flow of supplies from America to Germany during the early stages of the war was very irritating to Americans.

In August, 1914, a popular subject with American cartoonists was Uncle Sam "raking in the shekels" whilst the nations of the old world bled for their patriotism. It did not occur to the cartoonists then that the

British Navy might rather queer the pitch for the shekel snatchers. When they did realize it their cartoons took quite another character. One can understand the chagrin and sense of intolerable interference just as easily as one can understand how some four years later the American Navy was trying to outvie our own in this selfsame game. How circumstances alter cases, to be sure!

The subject of the rights of neutrals is extraordinarily difficult because it is extraordinarily beset with complications and contradictory conditions. On the face of it, to lay down that a peaceful people must suffer heavily, possibly fearfully, on account of a quarrel in which they have not the slightest concern, is manifestly most unjust. We adhere to this "regrettable necessity imposed by war." And yet no nation on earth has more to gain than ourselves from a full and complete application of the principle of freedom of the seas. American opinion generally—I do not say unanimously—deprecates any interference with trading vessels, neutral or belligerent owned, in war, leaving the issue to be fought out by armed ships. That would be fine for us and no mistake! Under such a code the U-boat campaign would have been impossible and the old bogey of a famine-forced submission would be scuppered once for all. On the other hand, this sort of thing is not war.

Those who seek to "humanize" war do not take it seriously. The Germans take war fearfully seriously. They are prepared to go to any length of frightfulness and to any sacrifice to get it over as quickly as possible—victoriously, of course. We do not take it quite so seriously, although we do not falter in sacrifice nor shrink from responding to frightfulness. That vast element of American opinion which puts "business as usual" first, and makes "humane" proposals to this end, is merely reducing the whole conception of war to a farce. I wish it were possible to reduce war to a farce; what jolly, popular, rollicking affairs the military professions would become!

As far as it is humanly possible to foresee, no great nation is less likely to be drawn into a war for her very existence than the United States. If such a war should come upon her, she could virtually wage it from out of her own self-contained resources.

Of course, she would suffer prodigious inconvenience and prodigious loss were she cut off from external communication—a thing in itself quite impracticable beyond a certain point. Realizing this, America not unnaturally views war from the standpoint which it suggests. The primary presumption in that standpoint is that America will be neutral in the sea warfare for the conduct of which she wants to dictate the rules of neutrality. In brief, she wants to maintain her own commercial interests, probably improve them, and she wants a supreme Navy to insure that she shall be in a position to do so. Well, these are practical politics, if not particularly heroic. But other nations have their standpoint, too, none more antagonistic to the American view than our own. Admittedly, our own standpoint has become ingrained from the usage of centuries. The idea that "Britannia rules the waves" implies the capacity to enforce our standpoint, whether it be right or wrong. Siege is one of the oldest methods known in warfare, and naval blockade is but a sea siege. In the jargon of the day we call it "economic pressure." War on the modern scale would be an interminable affair if it were to be determined by the conflict of well-fed, well-munitioned armed forces, with well-nourished nations behind them. Sheer exhaustion of wealth might ultimately end it, for neutrals would not go on trading with the poorer side, unable to pay. Our view of war—and the view of all the great nations into whose histories war has entered so largely—is that we do not want it to be an interminable business. We want to get through with it as rapidly as possible, and there is only one way of doing this—the way of *à outrance.*

Freedom of the seas would make war easier for our people at the price of prolonging it beyond calculation. Regarding war in all its hideous seriousness, we ask ourselves whether we lose more by allowing the enemy to intercept our trade than we gain by intercepting his trade. In this age of submarines and high-speed surface raiders there can be but one answer; we lose much more. But if we can endure beyond the point when the shadow of famine begins to darken the land we may hope to reach victory, owing to the much greater destructive efforts which we should anticipate from our superior naval power. This

sounds rather paradoxical. But in the great war Germany destroyed infinitely more sea-borne commerce destined for this country than we destroyed sea-borne commerce destined for Germany. We thus lost much more in this way than she did, yet we were able to endure when she collapsed, not wholly from inanition, but very nearly so. In launching her unrestricted submarine campaign against us, Germany definitely hoped to reduce us to peace terms—to her peace terms, of course—by hunger. In our own blockade of Germany we hoped to reduce her to peace terms by general physical exhaustion, in which hunger would certainly play a very prominent, if not the whole part. It is no use to mince matters; methods differed with circumstances, but ruthlessness was the principle on both sides when the two nations had got their backs to the wall and struggled for existence.

I do not question the sincerity of the American desire to see war "humanized," but the thing is impossible. You cannot humanize that which is essentially inhuman. You cannot play at "the rules of the game" as in a boxing ring, in our era of warfare which has developed aërial bombing, flame-throwing, submarines, mines, and—most sinister of all—gas. It is easy and pleasant in peace time, in a congenial and convivial environment for international delegates to sign a convention restricting submarine warfare. They quite mean what they sign; they do not feel in the least like submarining one another. But when it comes to the horrid reality the men who have to do the fighting are not going to submit to having one hand tied behind them. They are going to use their weapons to the fullest possible scope. Splendid fellows, who in normal times would shrink from the mere idea of killing women and babies, will loose bombs over a city without thinking. They dare not think. Once you begin to think in war you are soon face to face with the unanswerable fact that it is simply murder; that killing men in uniform with deliberate intent is even less justifiable than killing women and babies by accident. We have had a lot of psychological sob stuff about war of late. If it tends to render the possibility of war still more remote, well and good. But to imagine that it is going to have the least restraining effect should war come is mere bunkum.

And thus it is with regard to the freedom of the seas. President Hoover says that it is barbarous to starve noncombatants in war. So it is. But since it is impossible to put down a ring fence, and say that hostilities must only be carried on within it, clearly you cannot feed noncombatants without also feeding combatants. President Hoover must perfectly well know that the American people need never fear famine in the event of a war. Therefore, he can only be attempting to lay down a humane code for other nations not so fortunately circumstanced. America might feed those other nations and supply them in various directions. This would either be humanity or profiteering, according to the point of view. But whichever we may call it, the result would be the same; it would indefinitely prolong the war. America is at war against intemperance; she denies the freedom of the seas for the benefit of those perfectly reasonable people who like a little drop of something neither "soft" nor flatulent.

In the past this country has never been confronted by a neutral so powerful as to be able to dictate the principle of trading with the enemy. Our Navy has always been of such strength as to be able to maintain blockade. Twentieth-century Socialism is changing all this, and quite ecstatically surrendering the trident to the United States. There is no "bunk" about American principles in relation to peace or war. It is "America first and the rest nowhere." This is a fine sentiment—for Americans. But it means that other people's wars must not interfere with American business with those peoples. This is the real gist of the demand for freedom of the seas. In peace time it can all be put into conventions, treaties, pacts, and all the rest of the gold-fountain-pen, horn-rimmed documents. In the deadly struggle of modern war no nation is going to accept defeat because of scraps of paper. America quite realizes this, and so she wants the most powerful Navy in the world. In other words, her conception of the freedom of the seas appears to be supremacy on the seas to enable her to carry on "business as usual."

The Rôle of the Destroyer

Naval and Military Record, October 29.—The French and Italians have built, and

are building, "superdestroyers" of considerably over 2,000 tons displacement. These vessels are reputedly designed for ocean work. The latest British destroyers are about 1,300 tons in displacement, an advance of about 300 tons upon the average burden of the war period. The new flotilla leader *Codrington* is of barely 1,800 tons displacement and a trifle smaller than the average of the vessels of this category. The much heavier tonnage favored by the Continental powers leads to some interesting speculations as to how far the distinctive rôle of the destroyer is becoming lost in the evolution of type. Vessels of this description, armed with guns firing shells of 80 pounds in weight, are really small light cruisers. But the modern cruiser is actually equipped with more torpedo tubes than the modern destroyer, so that it is pretty evident she is intended to fulfil the functions of the destroyer. Apparently these French and Italian "super" boats are not designed for flotilla work at all, but for general "coast and colonial defence duties," just whatever that may mean as a specific *metier*.

The evolution in size is not justified by any increase in speed. In spite of the much-advertised records of certain foreign vessels it is open to question whether the forty knots actually touched by one of our *Tribal* class of 970 tons some twenty-two years ago has really been surpassed under equivalent conditions. But growth of displacement has brought a much wider sea-keeping radius. If we are to regard the destroyer as a fleet unit, it may be asked what advantage lies in such a large extension of cruising capacity. Our *Amazon* and *Ambuscade* managed to cross from the channel to South America and they are little more than half the size of the continental "superdestroyers." What, then, is the explanation why the torpedo unit, destroyer and submarine alike, has been carried to a stage of development which appears wholly supererogatory to her original purpose? Why have the French and the Italians—both nations with a genius for naval design—made a light cruiser of the destroyer, and why are all the principal naval powers making a glorified destroyer of the cruiser?

In our view the chief explanation for this development must be sought in the growth of the torpedo. At the beginning of the present century the effective range of the torpedo was 1,200 yards; today it is 12,000 yards, and there is reason to believe that experiments have been successfully carried out up to 19,000 yards. The destroyer of thirty years ago had to approach very close to her objective if she was to stand a good chance of getting home her weapon. The *River* class of that period were vessels of 550 tons and twenty-five knots, and the general verdict in the service was that they were too big! Whether, in spite of the wonderful precision of the modern torpedo and of the optical instruments now in use, very long-range torpedo attack would prove worth while in action is much to be doubted. The latest pattern in the British Navy takes about twenty minutes in reaching its journey's end. It can be relied upon to arrive exactly where it is expected to arrive; but can its target be expected to conform to the same method of calculation? In twenty minutes a warship may very appreciably increase or decrease her speed or alter her course. At Jutland the contending fleets found very little difficulty in evading the destroyer attacks, which were not delivered from anything like such distances as we are discussing.

It may well be that dubiety as to the value of torpedo attack in fleet actions has largely influenced the tendency to adapt the destroyer to other functions. She no longer remains what Kipling called the "chooser of the slain." She continues to fulfil her original rôle, but she is certainly not limited to that rôle. During the great war our destroyers used their guns very much more than their torpedo tubes. In peace-time "police work" they frequently use their guns, never their torpedo tubes. Thus the tendency is for them to become gunnery ships fitted to fire torpedoes instead of torpedo craft able to fire guns. Thus we come to a logical explanation as to why the modern cruiser actually carries more torpedo tubes than the modern destroyer. Had it been practicable to give the submarine the necessary submerged speed she would have replaced the destroyer for the delivery of torpedo attack in a fleet action.

NOTES ON INTERNATIONAL AFFAIRS

FROM NOVEMBER 4 TO DECEMBER 3
PREPARED BY PROFESSOR ALLAN WESTCOTT, U. S. NAVAL ACADEMY

UNITED STATES AND WORLD AFFAIRS

HINT OF STRENGTHENING KELLOGG PACT.—The idea of "implementing" the Kellogg Peace Pact by adding to it a definite agreement for consultative action among the powers in the event of any threat to world peace, was given considerable stimulus by President Hoover's carefully considered statement on the subject in his Armistice Day address in Washington.

"There has been much discussion," said the President, "as to the desirability of some further extension of the pact so as to effect a double purpose of assuring methodical development of this machinery of peaceful settlement, and to insure at least the mobilization of world opinion against those who fail when strain comes. I do not say that some such further step may not some day come about."

This passage was taken as evidence that the United States government is now receptive to the idea of a consultation agreement, though the suggestion must come from other powers. Proposals of this nature were advanced at the London naval conference, but at that time Secretary Stimson was unwilling to jeopardize the naval agreement by hooking to it a political commitment of any kind.

DOES THE WORLD WANT PEACE?—In an article of this title by Dr. David Jayne Hill in December *Current History* the point is strongly emphasized that: "Defensive armament is not in itself a cause of war . . . . nor would total disarmament by any nation be a preventive of war. On the contrary it might invite and would encourage attack." Rather, according to Dr. Hill, the possibility of world peace would come from a departure from the old conception of the state, as a "power" existing for the purpose of territorial expansion, exploitation of weaker peoples, and commercial advantage derived from injury to other nations. "In 1930," he writes, "we find that the traditional conception of the state as preëminently 'power' still persists." Of the value of the Kellogg pact, he writes:

> The most important consideration to be noted in an effort to determine the value of the pledges contained in the pact of Paris is not so much the existence of defensive national armament, which will for economical reasons be diminished when security is firmly established by mutual understandings, as the conception which the nations actually entertain of the essence and functions of the national state.
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> When we examine critically the actual mental attitude of the nations in 1930, and ask the question, "what do the people composing them expect of their governments?" we cannot escape some distrust of the ability of several of them to conduct themselves in such a manner as to avoid armed conflict.
>
> The year has been characterized by three phenomena that are extremely disconcerting to those who hope for and desire the peace of the world.
>
> The first is the multiplication of dictatorships apparently made necessary by the failure of democracy in several important nations to secure public order.
>
> The second is the unusual crop of revolutions in some of the best established republics of the Latin-American states.
>
> The third is the widespread unrest and growth of subversive groups defying public authority and the rapid development of large organized minorities even in so highly cultured a state as Germany disclosed in the September elections by the Hitlerite movement and its avowed policies.
>
> It would be an ungrateful task to enter into

details regarding these contemporary manifestations of disunity and collapse, and it would be an inexcusable error to exaggerate them. Our interest in them from the international point of view, however, cannot be denied and their importance with regard to the fulfillment of national pledges must not be overlooked.

Curiously enough, the discussion of Dr. Hill bears a superficial resemblance to Dictator Stalin's recent prophecies of rivalry leading to warfare among the capitalistic "powers." The article deserves to be read by all who are interested in present efforts to bring about world peace by agreement.

WORLD COURT PROTOCOL TO SENATE.—On November 28 President Hoover definitely announced that he would submit the World Court protocol to the Senate for ratification during the session beginning in December. Whether the Senate will take it up before the end of the present session on March 4, postpone it for a special session, or leave it until the next regular session a year hence, is left in the discretion of that body. The President was no doubt stimulated by the very strong propaganda in favor of immediate action, but sentiment in the present Senate appears divided on the subject in about the same ratio as in 1926.

NEW BRAZILIAN GOVERNMENT RECOGNIZED.—Recognition by the United States of the Vargas government in Brazil came speedily on November 8, the U. S. State Department declaring that "the government will be happy to continue with the new government of Brazil the same friendly relations as with its predecessor." Presumably by coöperation, similar action was taken by Great Britain on the same date. President Vargas took the oath of office on November 3, named a strong cabinet, and set about measures of economic reconstruction, his stated aim being to make national prosperity less absolutely dependent on coffee production and prices by encouraging the development of other of Brazil's great national resources.

GENEVA CONFERENCES

EUROPEAN ECONOMIC CONFERENCE.—The economic conference of twenty-six European nations which met at Geneva on November 5 to seek methods of improving trade relations closed on November 28 with a disappointing absence of results. Indeed it was frequently made evident in the conference that national jealousies—as seen notably in the attitude of Italy toward a preferential grain tariff beneficial to Jugoslavia—still stand in the way of trade concessions. There will be another meeting in February, and meantime a prolongation of the present unofficial tariff truce.

On one point definite agreement was reached—that tariff reductions must be brought about by bilateral agreements, between two nations—and not by reductions *en bloc* as favored by Great Britain. It is stipulated also that countries not parties to such accords, including non-European powers, will benefit under the most-favored-nation clause.

The United States, which together with Japan and other non-European states, was represented at the conference by an observer, stands to be affected as soon as any real steps are taken toward European trade solidarity.

ARMS COMMITTEE MEETING.—The preparatory committee for a disarmament conference met at Geneva on November 6 for a session which it was hoped could be concluded in a month's time and bring to completion a draft treaty, thus clearing the way for a conference not later than 1932. Before the end of November much real progress was achieved, made possible, at least in part, because the treaty is after all only a draft, and conflicts may be deferred till later on. The first important naval agreement was that there should be some direct limitation of naval personnel. The United States, Great Britain, and Japan at first took the ground that this would be automatically accomplished by limitation of material strength, but were persuaded by the French that unless naval effectives were limited it would be possible to evade army restrictions by training troops under the guise of naval forces. A second important decision as to naval limitation came on November 24 when by a vote of eleven to three it was settled that there should be a limit set on the financial expenditures of each nation. The three votes in opposition to this came from the United States, Japan, and France. The United States has con-

sistently opposed this method, and is likely to maintain its opposition, despite the admission by Great Britain that such financial limitation would apply to expenditures on naval bases, material for changing merchant vessels into cruisers, and in fact all kinds of naval outlay. A third interesting development in the naval discussion arose when the Soviet representative sought to commit the powers not only to "limitation" but "reduction" of navies. It became evident that France and a number of smaller nations did not care to be definitely pledged against naval increases, and the resolution finally was phrased "limit and reduce as far as possible."

An important American concession was that supervision and enforcement of limitation, when finally agreed upon, should be entrusted to a commission of restricted membership. The United States had previously opposed any form of international control. The question as to how the commission should be composed was left to the future conference.

GREAT BRITAIN

CONFERENCE ON INDIA.—The long-heralded round-table conference on India was opened by King George in London on November 12. Save that the conference was boycotted and scorned by the followers of Mahatma Gandhi, the eighty-six delegates present represented all races, religions, and castes in the Indian Empire. On the motion of the Maharajah of Patiala, chancellor of the Chamber of Princes, seconded by the Aga Khan, chairman of the British India delegation, Premier MacDonald was made chairman of the conference. With the 735-page Simon report and the Irwin plan of 256 pages as a basis for discussion, it was hardly believed that the conference could complete its work within three months time. The goal of its labors is a new constitution for India, abolishing the old diarchy or division of government between native and British authorities, and carrying as far as possible the "progress toward dominion status" which the British Labor government has accepted as a guiding principle in Indian reforms. Whatever is accomplished in the conference must still be approved by act of Parliament. Anything short of virtual autonomy will probably mean that the conference has failed; and on the other hand it is doubtful whether today the Gandhi party will accept even full dominion status unless accompanied by the right of early secession.

After a week of preliminaries, including some fifty speeches in five days, the conference settled to work, establishing first a large committee on federal relations to consider the whole field of political problems involved in the creation of new federated state. Among the delegates at the conference, the nationalistic feeling was unexpectedly strong, partly no doubt because of the strength of that feeling at home. The Indian princes, who have profited most by British domination, and the "untouchables" at the other extreme, who could expect least from native control, were joined in sentiment for increased home rule. Early in the conference a written agreement was signed declaring that the lowest caste should have equal representation under the new constitution.

Speaking for the Labor government, Premier MacDonald has made sweeping if somewhat indefinite assurances, declaring that his government accepts every official promise that has been made to India since 1917. It remains to be seen whether Parliament will stand behind him in bringing these promises to a reasonable measure of fulfillment.

FAILURE OF IMPERIAL CONFERENCE.—Despite accomplishments in the field of political relationships, the Imperial Conference which closed its session in London on November 14 failed completely in its main object of bringing the empire into closer economic union. British free trade sentiment killed the scheme for preferential tariffs. All that was agreed upon was a continuance for the next three years of the existing margin of British tariff preferences. Meantime Canada and Australia are seeking a preferential agreement among themselves, and it is possible that other bilateral arrangements may be made, if, as proposed, the conference is renewed at Ottawa during the coming year.

Among constitutional and other changes, the conference agreed: (1) that governor generals shall henceforth be named by the king on the advice of the dominion ministers alone, the British government not in-

terfering unless called upon for advice; (1) that an "empire tribunal" shall be created for suits between dominions; (3) that the completion of the Singapore Naval Base shall be postponed for five years. This last does not mean suspension of the present building contract or delay in completion of the aviation base there, but only that expenditures for equipment and defenses will be held up. Out of these changes comes a clear recognition that Great Britian is now on an equal status with the other dominions —one of them as the "Dominion of Great Britain." Another point decided is that changes in the royal succession will be valid only when ratified by all the dominions, thus precluding a possible division of the kingship.

PALESTINE POLICY EXPLAINED.—The government explanation of its Palestine policy, necessitated by the tremendous Jewish resentment aroused against the declaration of Lord Passfield in the white paper of October 20, was made by Premier MacDonald early in November. Assurance was given that there would be no violation of the Balfour Declaration of November 2, 1917, and promise was made of a loan of $12,500,000 for settlement of both Jews and Arabs on the land. Despite the manifestations against the white paper, there is little doubt that the country is behind the government in its effort to control the influx of Jews into Palestine to the least injury to the Arab population already there. Fairness to both races may obviate heavy military expenditures for the maintenance of order in the troublesome mandate.

GERMANY AND CENTRAL EUROPE

GERMAN FINANCE MEASURES APPROVED.—Having secured from the German Reichsrat (Federal Council) full approval of his program of fiscal and economic reform, Chancellor Bruening faced at the close of November the stiffer fight which he might expect from the Reichstag upon its reassembly on December 3. Rather than subject his two dozen or more bills to attack in detail, he secured on December 1 a decree from President von Hindenburg putting the whole program into effect by executive decree. The Reichstag was thus forced to consider the problem as a whole, either approving the decree or disapproving the government. Despite rumors to the contrary, fairly definite assurances came from Germany at the close of the month that there would be no immediate appeal for a debt moratorium—but quotations on German bonds issued under the Young Plan have fallen about 25 per cent.

PILSUDSKI WINS POLISH ELECTIONS.—Elections held in Poland on November 23 to choose members of the Sejm, or parliament, gave the bloc of parties supporting Marshal Pilsudski a solid majority of 247 out of 444 members. The new parliament was to assemble on December 9, with prospects that the Marshal would find his elective body more docile than in the past. The Marshal on November 28 turned the premiership over to his party leader, Colonel Slawek, returning to his former practice of directing Polish politics from behind the scenes.

The campaign was generally characterized as "spiritless and drab." There was only one alleged bomb plot against Pilsudski. However, at least six were killed and many injured in what was apparently a campaign of terrorism against the German population in Upper Silesia, prompting a vigorous protest on the subject from the German government to the League Council.

ELECTIONS IN AUSTRIA.—The parliamentary elections in Austria on November 9 failed to duplicate the recent swing in Germany toward extreme nationalism. The Socialist party held its strength of seventy-two votes, while the Christian Social party led by Manager Seipel secured sixty-six, the new economic party formed by ex-Premier Schober nineteen, and the Heimwehr or extreme nationalists only eight. Possibilities of a Heimwehr dictatorship vanished with this meager show of voting strength.

SOVIET RUSSIA

MOSCOW TREASON TRIALS.—Historians who have regarded nationalism as the chief enemy of world peace may discover a still greater foe in internationalism of the Soviet variety, judging from the demonstrations of a mob a million strong in Moscow at the opening of the trial of eight engineers for plots against the Soviet govern-

ment. The readiness and coolness with which the prisoners told their stories, involving prominent political figures in England and France, lent support to the opinion abroad that the trials were a "frame-up," to justify army expenditures and distract attention from economic difficulties.

FAR EAST

JAPANESE PREMIER WOUNDED.—On November 14 Yuko Hamaguchi, Premier of Japan and head of the Minseito party, was shot by an assassin and seriously wounded in the abdomen. The attack took place in a Tokio railroad station and was committed by a young fanatic, a member of a reactionary patriotic organization. Reports two weeks later indicated possibilities of the premier's recovery.

JAPANESE NAVAL BUDGET (New York *Times*, November 11).—Tokyo, November 10.—The long dispute between the government and the naval authorities over the naval budget, which was carried on simultaneously with the fight over ratification of the London Naval Treaty and has since continued to be a bone of contention, was at last resolved today when an agreement was reached on a program calling for an expenditure of 373,000,000 yen ($186,000,000) over a period of six years.

The new naval program provides for the expenditure of $109,000,000 for new war vessels during the next six years, including $80,000,000 for replacements provided in the London treaty and $29,000,000 for vessels not limited by the treaty. The air force will be expanded by the creation of twelve new air corps, absorbing $45,000,000, including the cost of upkeep. An item of $25,000,000 is included for modernization of capital ships.

While a heated debate is likely to develop in the Diet concerning the naval program, its passage as submitted is virtually assured, since the Diet rarely interferes with army and navy budgets.

NEW MANCHURIAN PORT.—The November *Current History* quotes an article by Paul Wang on the development of a new harbor project at Hulutao, Manchuria, sponsored jointly by the Nanking and Manchurian governments, on which work began last July. The article follows in part:

> Hulutao is a small peninsula, projecting into the Gulf of Liaotung, 184 miles south of Mukden, the capital of Manchuria. The harbor has a natural depth of from twenty-seven to fifty feet, enabling ocean steamers to enter without much dredging, and it has the additional advantage of being practically ice free all the year. It was not until March, 1929, that the Nationalist government came to an agreement with Manchurian authorities to provide $25,000,000 for the construction by 1930 of a harbor with a capacity for forty vessels and an annual tonnage of 3,000,000 to 4,000,000. In connection with the harbor, elaborate plans have been drawn up for Hulutao City, providing for commercial and residential districts, parks, waterworks, light, and power. Anticipating significant effects on the trade of Manchuria, the Chinese have built a number of new railways extending northward through Manchuria, with Hulutao as a starting point. Built with Chinese capital and under Chinese management, they aim to compete with the Japanese South Manchuria Railway and the Soviet Chinese Eastern Railway. Great Britain and Japan are the two countries most affected by the new harbor. Japan, while doubtless secretly worried, took no action, but Great Britain did object. She protested on the ground that the payment for the harbor construction from the revenues of the Peiping-Liaoning Railway is in violation of the Peiping-Liaoning Railway loan contract of 1898. But Great Britain's protest served only to strengthen China's determination.

KUOMINTANG EXECUTIVE COMMITTEE MEETING.—The central executive committee of the Kuomintang party, consisting of fifty-five members, held its fourth plenary session on November 14-19. Numerous proposals were considered for simplifying government machinery, settling the problem of military control in northern China, and dealing with banditry in central and southern China. President Chiang Kai-shek made a vigorous appeal for honesty in handling government affairs.

EXTRATERRITORIALITY OFFERS. — Both American and British proposals, much the same in general character, were made to China in November on the subject of gradual relinquishment of extraterritorial rights. The American proposals are based on the principle of relinquishment in certain territories, and over certain kinds of jurisdiction, according as progress is made in the enactment and enforcement of modern codes of laws. No immediate concessions are granted.

BOOK DEPARTMENT

Members of the Institute may save money by ordering books through its Book Department, which will supply any obtainable book. A discount of 10 per cent is allowed on books published by the Institute, and 5 per cent on books of other publishers (government publications excepted). Address Secretary-Treasurer, U. S. Naval Institute, Annapolis, Maryland.

SEA FIGHTS (The Entente upon the Seas) 1914-1918. By Paul Chack.—Translated from the French by Commander L. B. Denman, R. N. Liége: Vaillant-Carmanne. 1928. 4/6.

REVIEWED BY LIEUTENANT COMMANDER A. H. ROOKS, U. S. NAVY

This work described on the title page as a historical romance, was published in France in 1927 under the title *On se bat sur Mer,* and brought its author, Commandant Paul Chack, chief of the Historical Department of the French Admirality, Le Prix de la Renaissance, the highest literary prize in France. It is a collection of four stories, more or less unrelated, brought together in one volume to show, in the words of the author, "the three great allied navies—British, Italian, and French—raising, side by side, the formidable floating barricade, set up against the limitless ambitions of continental tyrants." Commandant Chack believes that it was the magnificent work accomplished by the ships of the Entente which was the salvation of liberty, and that, in the final analysis, it is the everlasting lesson of history that from the sea, victory or defeat will come. None of the tales here recounted deals with the really decisive naval actions of the war, some of which the author has covered in previous works. They were apparently chosen for their dramatic and popular appeal.

The first, entitled "After the Manner of Surcouf," is the story of the French steam trawler *Nord-Caper* on antisubmarine patrol in the Mediterranean, and of how her crew of thirty men, twenty of whom were without arms, boarded and captured a Turkish schooner manned by forty-three men armed to the teeth, eleven of whom were officers in the Turkish Army, thereby earning for themselves and for their ship the glorious *fourragère,* which no surface vessel of the French Navy had ever before gained.

The second, "A Cruise of Misery," is an excellent account of the destruction of the German commerce-raiding cruiser *Koenigsberg* in her "den in the forest" miles up the delta of the Roufidji River on the east coast of Africa, and of the extraordinary events leading up to it.

In "France Saves the Suez Canal," we find the story of the Turkish campaign against the canal and against Egypt, and how it was defeated, largely, so the author claims, through the activities of the French seaplane patrol and of the coast defense battleship *Requin* and the *D'Entrecasteaux.*

Finally, in "Mare Amarissimo" is a story familiar to readers of the PROCEEDINGS, that of the Otranto patrol and the torpedoing and sinking of the Austrian battleship *Szent Istvan* by Comandante Luigi Rizzo of the Italian Navy, a short account of which was given in the article "Davids of the Sea," by Lewis Stanton Palen, published in the December, 1928, issue.

Because this work gained a high literary prize in France, it must be assumed that it was brilliantly written. The translation might even be considered so were it not

that it is so atrociously edited, a circumstance partially explainable, perhaps, by the fact that it was printed in English in Liége. Colons, semicolons, commas, dashes, and periods, usually employed to render easy and swift the reader's progress through a maze of words, are here flung with such reckless abandon as almost completely to obfuscate the meaning. If toward the end the reader becomes aware of a certain order in the succession of marks, he must conclude that, though there's method in it, yet this must be madness. In spite of this, the drama of the stories and a certain unforgettable quality in their telling compel the attention of those of us who are interested in the great deeds of those men of all nations who follow the sea's adventurous paths.

MARITIME TRADE IN WAR. By Lord Eustace Percy, New Haven. Yale University Press. $2.00.

REVIEWED BY LIEUTENANT MELVIN F. TALBOT (S.C.), U. S. Navy

In the hundred odd pages of this volume of lectures delivered before the Institute of Politics at Williamstown, Lord Eustace Percy treats in a clear, brilliant, and scholarly manner that most important international problem, "the freedom of the seas." An understanding of the principles and policies that underlie the use of navies to exert economic pressure in time of war is of special interest to American naval officers, for nothing is more likely to involve us in a general war than the age-old dispute between belligerent and neutral rights.

The author frankly states that the subject presupposes the possibility of war, and that he cannot accept the claim that under the Kellogg pact there can be no war, or that under the League Covenant there can be no neutrals.

Complete freedom of the seas has never actually existed, except perhaps in Roman times, when, as Sir Henry Maine remarked, the seas were free "only in the sense of being universally open to depredation." With the growth of modern nationalism, development was away from the freedom of the seas. Venice laid claim to the sovereignty of the Adriatic, England to the North Sea and the Channel. This doctrine of *mare clausum* reached its final extension in the pretentions of Spain and Portugal to the lands and oceans of the New World. England and Holland were quick to reverse the doctrine of the closed seas, and to claim the right of navigation and of trade in the waters of America and the Indies. Expansion of commerce necessitated the suppression of piracy, later of the slave trade, and the extension of municipal law over the clearance of cargoes. Thus there gradually evolved a system which now regards the seas as free in time of peace only to vessels of known nationality, in which national law runs, sailing the highways of the ocean on legitimate business. This limited freedom is preserved "by deliberate partnership as necessary to all nations, and open to all so long as the seas are used in the common interest of all."

But what of war? the author asks. What happens when this deliberate partnership is broken, and certain nations look to the use of naval power to interrupt the sea-borne trade continuance of which is a benefit to their enemies? There follows a chapter on the doctrine of blockade and contraband. The doctrine of contraband favors the policy of British sea control, while the doctrine of blockade legalizes naval action, that if turned against her, as the Germans sought to turn it, can mean complete starvation. The neutral ports of Copenhagen and Rotterdam, with ready access to Germany, rendered useless a blockade of the German coast. British action against commerce destined for Germany had therefore to be based on the doctrine of contraband, developed and extended by Orders in Council so distasteful to American opinion, rather than on the doctrine of blockade, under which the North had a century before vindicated its complete encirclement of the Confederacy. And in a future war, except against the island empires, Britain and Japan, even close blockade would prove powerless. Commerce must now be halted, not at its terminus, but at sea or at its source.

And yet if the doctrine of blockade can no longer be applied to modern war conditions, the doctrine of contraband is equally unacceptable as a pivot for international law. It can again be subjected to a perfectly logical extension and made the basis for forbidding all trade of possible enemy character except that necessary to "ration" neutral nations so unfortunate as to have a common frontier with the beleaguered

enemy. When, at the will of a belligerent, very nearly everything can be called contraband, "free ships, free goods" becomes a meaningless phrase. To accept this extension of the contraband theory is not to settle equitably and definitely for all times the rights of neutral trade in war, but to argue them out of existence by a logical extension of the rights of belligerents.

The picture is not yet complete. Empires within whose territories originate the raw materials on which the economic life of neutrals largely depends, have another weapon in "export control," a weapon that can be effectively wielded "without moving a ship or firing a gun." They can in effect say to neutral traders, "Unless you limit your exports to consignees in neutral ports whom we can trust not to re-export to our enemy, we will deny you our shipping facilities, our bunker coal and oil, and the whole list of materials which we produce and of which you and your fellow traders stand in need." To enforce export control necessitates interference with neutral trade at its source, an interference more irksome and even more of an invasion of neutral sovereignty than the recognized exercise of belligerent rights at sea. And even more dangerous to the peace of the world is the fact that the contemplation of export control accentuates the scramble for economic power in time of peace, a competition that may well lead to war. Every move in international business can then be looked on with suspicion. "The acquisition of a wolfram mine in Bolivia by an American or a Canadian firm becomes a move in the war control of munitions, and a shipping merger in the West African trade is judged according to whether its management *in time of war* will be in London or in Paris."

If such, under existing conditions, are the probable extensions of international law, the author insists that the time has come for a fresh start. "If the world is again confronted by the hard facts of war, we may well fear that we shall not only see the old disputes and recriminations renewed, but shall see them renewed with all the added bitterness which moves men when they find that the settled rule of law which they had been taught to respect as guaranteeing the rights of the weak turns out, after all, to be only a new expedient for confirming the power of the strong." The codification of international law offers no solution, for the decisions of the prize courts rendered in England during the Napoleonic Wars and the World War and in the United States during the Civil War have never been accepted by continental jurists, nor have they received the moral sanction of world opinion.

The fresh start, our author suggests, should first be made by Britain and the United States. These two nations alone should proceed leisurely to examine through an expert commission meeting quietly at Ottawa, far from "the charged atmosphere of international conference," the rights of neutrals and the rights of belligerents in the light of past history and of modern war conditions. He believes it possible that an agreement be reached on some method of distinguishing between a general war, in which the banded nations seek to restrain an aggressor and maintain world order, and an "ordinary war," whose issues are of minor consequence to the world at large. Failure to accept arbitration of the dispute about which the war started would mark the aggressor. Against such a nation complete blockade would not only be legal but would receive the aid of export control by all neutrals. On the other hand, complete freedom of the seas would be the right of belligerents in an "ordinary war" and of those who notify the family of nations their willingness to accept arbitration. The suggestion savors of the familiar British claim to the unlimited use of sea power in a war fought to protect the world from aggression. And yet it has something in common with the American idea "the outlawry of war," which was the basis of the pact of Paris. Complete freedom of the seas in an "ordinary war" would mercifully restrict the use of navies to their military purpose, to "assure the strategic mobility of armed forces," and would limit to wars of extraordinary extent and intensity that most crushing of all weapons—blockade that strikes alike soldier and civilian.

But whatever the solution, if indeed any solution be possible, it must be freely admitted that the present uncertain state of international law is unsatisfactory both to those who emphasize neutral rights and to those who stress the rights of belligerents. The economic and naval preparations that will be made to vindicate their conflicting

claims, unless an agreement can be reached, will not be salutary for a world scarcely yet recovered from a war whose blockades and counterblockades very nearly destroyed the fabric of European civilization.

Few books on international affairs give a clearer and more profound insight into the dangers which confront the world today, few volumes on international law are as readable as this little book, and all too few treat a difficult topic in as simple and unpretentious style or so honestly attempt to approach without national bias an extremely controversial subject.

GLIDERS AND GLIDING. By Lieutenant Ralph S. Barnaby (C.C.), U. S. Navy. New York. The Donald Press Company, 1930. $3.00.

REVIEWED BY LIEUTENANT COMMANDER D. C. RAMSEY, U. S. Navy

Lieutenant Barnaby has written a very interesting and illuminating book. It is appropriate that a treatise of this nature should be undertaken by an officer whose interest and practical experience in gliding dates back to the year 1911. Lieutenant Barnaby's subsequent achievements in the field of gliding which include qualification for the first glider pilot certificate awarded by the National Aëronautic Association and experimental launchings from the airship *Los Angeles* definitely qualify him as an authority in this branch of aëronautics.

Apart from the clarity and general excellence of the text *Gliders and Gliding* contains an abundance of interesting illustrations and an even greater number of equally interesting sketches and diagrams, the work of the author, who, thus, by a combination and coördination of talents has presented his subject in a manner which leaves little to be desired.

Starting with a discourse on the general classifications of motorless flight the author deals briefly with the history of gliding and emphasizes the importance of the research and experimental work which has been carried on at that mecca of gliding enthusiasts, the Wasserkuppe in the German Rhone.

The principles of control operation and aërodynamic fundamentals are covered in the next chapter which is followed by a detailed exposition of instruction and launching methods, and the control of gliders in flight. This part of the book should hold the undivided attention of airplane pilots who will realize after thoughtful contemplation that there are several important problems connected with the art of flying that are part and parcel of motorless flight; problems that do not enter into the joys or anxieties of the pilot who counts normally on judicious use of the throttle to get himself into the air and safely back to *terra firma.* As the author aptly points out every landing in glider flying is "dead stick." It follows that some degree of speculation may arise as to whether a piloting course in gliders may be as useful in leading up to airplane flying as indoctrination in the latter would be in the making of a successful glider pilot. All factors considered, it would appear that motorless flight, particularly soaring flight, exacts heavier demands upon the pilot and requires keener reflexes, judgment, feel, and air sense than is demanded by power flying.

The author dwells at some length on the subject of soaring as distinguished from gliding and further subdivides soaring into its static and dynamic elements. His treatment of static soaring is comprehensive and correspondingly clear to the reader, but his discourse on dynamic soaring is not quite so illuminating. It is realized, however, that detailed treatment of this theoretical subject is beyond the scope of a book which is designed to hold as much interest for the non-technical as the technical reader.

An entire chapter is given over to the Design and Construction of Primary and Secondary Gliders. This section should be of particular interest to potential glider builders who will find it a valuable work of reference. The admonition of the author should be heeded that the design of gliding and soaring planes is a matter which belongs properly to aëronautic engineers and not to amateurs. If construction plans of proved products are made available, or if construction data vouched for by reliable agencies can be obtained, the actual construction of gliders may be attempted by amateurs; preferably those skilled in the manual arts. It is obvious that high-school boys or young college men left to their own devices in work of this nature would complete it to their satisfaction with the utmost dispatch, animated and dominated by desire to leave the ground at the earliest pos-

sible moment in an instrument of wood, wire, and fabric which they had pieced together with their own hands. In all institutions where such projects are encouraged provision should be made for qualified and expert supervision of these activities. Should an over enthusiastic young man express desire to make his first solo in towed flight behind an automobile it is believed that a study of the picture which appears on page 55 of Lieutenant Barnaby's book will have a stabilizing influence.

Lieutenant Barnaby comments on a recent tendency throughout the country to hold glider competitions in conjunction with air meets and maintains that such efforts are futile so far as the promotion of gliding is concerned.

The author concludes his work with a brief dissertation on the future of gliding and soaring. He holds that the localities not known in the United States which offer the greatest possibilities for soaring flight are in the vicinity of Cape Cod, Point Loma, Uniontown, and Elmira. Many other possible regions remain to be explored. He closes with the statement that; "Gliding is a sport of the hills and not of the plains and sad though it may seem, in the light of our present knowledge, it must so remain." This note of conservatism prevails through the book.

THE BOYS' BOOK OF ANNAPOLIS.

By George L. Knapp. New York: Dodd, Mead and Co. 273 pages. $2.00.

REVIEWED BY PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

Even after years of intimate contact with the Naval Academy one might hesitate to describe its life, without having spent four years "going through." But just as a clever reporter can doubtless catch the surface of life on a battleship in a single cruise, and tell the folk at home what they want to know, so the author of *The Boys' Book of Annapolis* has gathered much useful information, and put it into lively, readable form. There are slips of course—one doesn't cross Dorsey Creek to go from Bancroft to Isherwood Hall—but the facts are generally straight.

There are chapters on getting into the academy, settling down, routine, studies, athletics, and prospects after getting out either into the service or into civil life. This done, Mr. Knapp feels he has a roving commission, sketches the careers of Paul Jones, Bob Evans, Byrd, Mahan, and Michelson, tells the stories of the privateer *General Armstrong* and the yacht *America*—all of which makes good boys' reading, though the reviewer's daughter said she liked books with "more talk."

BROWN'S NAUTICAL ALMANAC, 1931.

Edited by James R. Brown, assisted by Captain Charles H. Brown. Glasgow: Brown, Son, and Ferguson, Ltd. 3s.

REVIEWED BY COMMANDER H. H. J. BENSON, U. S. Navy

Brown's Nautical Almanac is published annually. In addition to the almanac data it contains a large amount of useful information for mariners. A few of the subjects are: How to find principal stars, various tables for the navigator, distance tables, tide tables, courses and distances, light lists, systems of buoyage, nautical meteorology, port charges, regulations for preventing collisions at sea, and many other things too numerous to mention. With so much information in one volume, it is a very useful book. This book is probably of more value to the merchant officer than the naval officer.

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From the original presented to the U. S. Naval Academy Museum by Rear Admiral C. F. Goodrich, deceased, 1925.

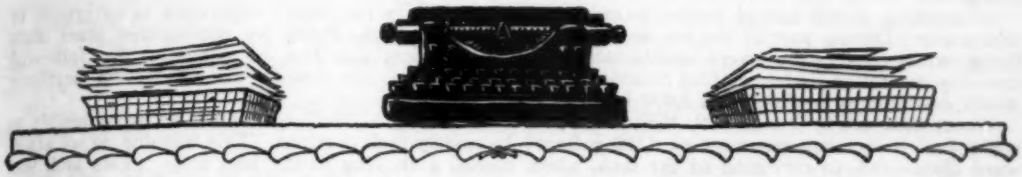
CLASS OF 1864, U. S. NAVAL ACADEMY, NEWPORT, RHODE ISLAND

Midshipman Caspar F. Goodrich, who led this class, is seated in the front row, with arms clasped around a classmate, John Schouler, fourteenth and fifteenth from the left. Others in this class (reading from left) are: F. W. Dickens, James B. Weaver, George E. Ide, A. H. Fletcher, D. C. Woodrow, G. W. Armentrout, G. V. Menzies, W. M. Folger, T. F. Jewell, C. J. Train, C. H. Davis, G. N. Flagg, T. S. Wilson, C. F. Goodrich, J. Schouler, G. W. Pigman, H. Elmer, H. C. White, F. E. Chadwick, B. P. Lamberton, J. C. Kennett, Oscar F. Heyerman, G. F. F. Wilde, S. H. Baker, E. White, B. H. McCalla, H. T. Dunn, A. G. Caldwell, F. H. Sheppard, C. F. Schmitz, E. C. Stedman, C. W. Kennedy, E. B. Thomas, H. C. Raebel, A. H. Vail, G. S. B. Sullivan, S. L. Wilson, J. A. Vaughan. Absent: A. L. Baker.

Photo by Harris and Ewing

REAR ADMIRAL CASPAR F. GOODRICH, U. S. NAVY
The twelfth president of the U. S. Naval Institute, 1904-09.

SECRETARY'S NOTES



Rear Admiral Caspar F. Goodrich

The *Army and Navy Journal* of January 2, 1926, contains the following item:

"Rear Admiral Goodrich was born in Philadelphia, Pennsylvania, January 7, 1847, and died at his home in Princeton, New Jersey, December 26, 1925, in his seventy-ninth year. Admiral Goodrich was graduated from the Naval Academy at the head of his class, in 1864, and was assigned to the *Colorado* of the European Squadron, and later to the *Frolic* on the same station, on which he served until 1868. After being commissioned lieutenant he served in the *Portsmouth* and then in the *Lancaster* of the South Atlantic Squadron to 1871. He subsequently, among other duties, served at the Naval Academy, in the *Tennessee* and *Kearsarge*, of the Asiatic station, at the torpedo station, and served in the *Lancaster* of the European station, 1881-84. He was naval attaché on the staff of Lieutenant General Sir Garnet Wolseley during the Tel el Kebir campaign in 1882. In 1884 Admiral Goodrich, then a lieutenant commander, brought back the relief ship sent after the Greely polar expedition safely to New York after a difficult voyage. He was a member of the Endicott fortifications board in 1885, was in charge of the naval torpedo station, and was made president of the Naval War College in 1896, and gold medalist of the Naval Institute, 1898. He commanded the auxiliary cruiser *St. Louis* and the *Newark* during the Spanish-American War. He had the first engagement with the batteries at Santiago while cutting cables, aided by the *Wompatuck*, and fought the last naval action of the war at Manzanillo. He was assigned to duty at the Naval War College in 1900. He was later in command of the *Minneapolis* and *Richmond;* commandant of the navy yard, Portsmouth, New Hampshire; was promoted to rear admiral in 1904, and placed in command of the Pacific fleet, in which capacity he did signal service at the time of the San Francisco earthquake, by hurrying his ships to the stricken city and giving assistance of every kind. He was assigned to command the navy yard, New York, in 1907, and was retired on account of the age limit January 7, 1909. It was at daylight on May 18, 1898, that Admiral Goodrich, then a captain, performed his memorable feat of cutting the cable from Santiago de Cuba to Jamaica and Haiti. He ran within 2,500 yards of the land batteries, enduring their shot, and actually silencing with his own small guns the fire of two of the most dangerous batteries. After a first unsuccessful attempt he next destroyed the French cable from Guantanamo on May 20.

"Following the cutting of the Cuban cables, Captain Goodrich, in the *St. Louis*, joined the scouting squadron that was to follow the movements of Admiral Cervera. At the end of June, when the task of landing an army of 16,000 troops fell to the Navy, in the absence of lighters, the enormous task fell to Captain Goodrich. He landed the forces with its munitions in five days. In August he took part in the bombardment of Manzanillo, just previous to the signing of the peace protocol. On July 31 he had effected a landing of troops at La Playa, Porto Rico."

"A Practical Application of Navigation to Aircraft"

The following interesting letter has recently been received from Lieutenant (J.G.) H. P. McLean Connor, U. S. Naval Reserve, whose article appears on page 1065 of the December issue:

It may be of interest to you to know that since my article was written I have made a transatlantic flight in the *Columbia* from Montreal to London, England, via Harbor Grace, Newfoundland and Scilly Island, accompanied by Captain J. E. Boyd, Canadian. I served as navigator on this flight also.

For your information, I used the same methods of navigation as on the Bermuda flight, and data derived from the Atlantic flight adds little knowledge to my former theories with repect to aërial navigation.

If anything, it only served further to emphasize the necessity for expert experience in navigation by astronomy. During part of the ten and three-quarter hours night flying we encountered some blind flying, when observations were unobtainable. Upon obtaining sun line of positions the following morning, we found we had drifted considerably to south'ard of our course, due to terrific northerly winds encountered at 7,000 and 8,000 feet altitude.

About 0830 GCT, October 10, 1930, shortly after obtaining a "fix" we found we were unable to pump fuel from main reserve tank (100 gallons) to gravity tank in wings. This was due, as we afterward discovered, to corrosion of the tank, which caused a choking in the fuel line. (This tank was over three and a half years old). Knowing the performance of the *Columbia* from our Bermuda flight, we were able to conserve our remaining fuel by decreasing the revolutions proportionally. This necessitated reducing our r.p.m. from 1650 to 1400, which cut our fuel consumption from 12 gallons per hour to 8 gallons per hour and enabled us to reach land. Our course was set to Land's End (Bishop's Rock) and at 1540 GCT, October 10, we made landfall (Scilly Island) slightly on our port bow.

At 1602 GCT we landed at Tresco Beach, Scilly Island, continuing to Croydon, London, the following day. We took our departure from St. John, Newfoundland, at 1635 GCT, October 9, 1930.

Our flying time was 23 hours 27 minutes for the Atlantic crossing, during which passage we covered some 2,400 miles. We went considerably off our course in order to avoid a low pressure area extending off Ireland.

I believe this was the first Atlantic flight made at this season of the year, when long night flying was involved.

The main points I wish to emphasize are the necessity for a thorough knowledge of navigation in all its branches, careful preparation of ship and instruments beforehand, and perfect coöperation of each member of the crew.

The "Shamrock" Returns Home Under Sail

Through the kindness of Mr. Newcomb Carlton, President of the Western Union Telegraph Company, the Secretary is able to publish the following letter that should be of interest to all seagoing people. It is an account of the *Shamrock's* return under sail from Newport to Southampton, written to Mr. Carlton by his assistant, Mr. Irving Johnson, who made this trip as first mate of the *Shamrock*.

London, October 26, 1930.

DEAR MR. CARLTON:

We left Bristol October 2, towing to sea with a half drunk crew, for all the world like a square rigger. The only other American in the crew, a Bristol boy, had to rush to Boston for his passport at the last minute. He started by car, changed to airplane, which broke down, so continued by car to Boston. We left Bristol without him, so he flew from Boston to Newport and came out in a motor boat. This cost him more than his wages for the whole trip.

Going out the Narrows, those of the crew who were able helped me stow the anchor and chain below decks and rig double life lines all around the ship. At Brenton Reef Lightship we made sail and cast off the tug just at nightfall. I chose the watches (three in one and four in the other) and set them four on and four off with regular dog watches. The captain and I stood watch more or less as we pleased, but never getting much sleep.

The crew were all first-class deep-sea sailors who go yachting every summer. Most of them have sailed in square rig. The captain is Scotch and has been skipper of a square rigger.

I got quite a thrill being in charge of a watch on a sailing ship bound for the high seas. (I didn't know they would be so high.)

The second day the wind was freshening and a sea making up. All hatches were battened down, the stove smoked and smelled, kerosene was spilled when filling lamps, making things unpleasant down below. I was the only one to eat a good breakfast. Even that didn't do me much good because I stayed below too long trying to work out my morning sights and had to feed the fish as every single man aboard had done before me. On deck it was all right, but that kerosene smell down below turned us all inside out.

The captain didn't even take sights, to say nothing about working them out.

More wind and sea that afternoon. The long ends of the *Shamrock* seemed to catch all kinds of crabs and jump us this way and that without any good reason for it. The heavy ballast made things move quickly too. Just before night the stay between the masts carried away, so we took in the jib to ease the mainmast and rigged one mizzen backstay forward to hold that mast.

I took over the watch at midnight with wind increasing all the time. She got going 11¾ knots by 4:00 A.M. so I told the skipper. He never had her over 10 with this small rig before, so yelled, "Take in main and mizzen and reef the forestaysail." I wanted plenty of sea room with the barometer going down the way it was, so kept her going.

We got into the Gulf Stream with a strong gale from the NE., against SW., current. All we could do was run before it under reefed forestaysail. Wind stronger all the time. In my morning watch a heavy sea broke aboard, sending the feet of the man at the wheel (who was 6 ft., 5 in. tall) higher than his head. He hung on like a good one and landed on his knees. Trying to see the course again he found the compass, binnacle, and stand washed clean overboard, and part of the steering gear box broken off. I grabbed the wheel and steered by the wind just so the staysail wouldn't jibe, or it would have left us. We soon took it in and ran under bare poles. The sea that took the compass split right through a heavy canvas weather cloth in the mizzen rigging before striking the man.

We then had a heavy gale with plenty of rain and tremendous seas. The ship was twisting and straining so, she started to leak. The deck leaked, and you wouldn't think she had any hatches on at all. Then it went almost flat calm, all but the sea. The barometer kept going down so we didn't set any sail. In about an hour it did start to blow! A northerly hurricane! Hell on the high seas, and how high. I think the Atlantic is just getting back at me for thinking Cape Horn was the only place to give men supreme misery.

We couldn't see twenty-five feet over the bow because of flying water. The only time we could look back was when we were down behind a huge wave out of the wind. To see a tremendous wave towering behind us nearly gave us heart failure, so we gave it up and looked ahead. I didn't have a sou-wester, so had to protect my ears from being cut by flying spray during squalls.

Eighteen hours under bare poles. We were all getting a bit weak from lack of food and sleep. Every square inch of the *Shamrock* on deck and down below was soaking wet. All the flour, bread, sugar, and other food was dripping wet. One grand mess below. All but three of the crew slept in their oilskins on the spare canvas, with a covering over their heads. I used the cook's apron to keep the water from running down on my face as I slept. We got shaken around like beads in a rattle. We sometimes dropped off a wave so quickly that the lanterns would go out. The dive stopped so suddenly that the whole stern as far as the wheel was driven under water.

The crew cursed the day they signed on this ship, and I was beginning to wonder whether it pays to do this kind of thing. Several times I have said, "Never again," but you know how much good that does.

The storm cleared up as they all do in time, but in a couple of days we had another from the east. More running under bare poles. The cook burned himself five times, and I was elected doctor. The captain hung up part of an old sail over his bunk to keep the *seas* off while he slept.

The turnbuckle on one of the backstays snapped, so we rigged them farther aft with tackles to take up the jerk. Later in heavy going these tackles started to give, so we had to double up on them.

Things were always breaking or chafing and the blocks which have no brass pieces over the pins were forever coming apart.

We rigged up a boat's compass on the wheel gear box, also a little light for night steering.

After this easterly the wind became fair and never headed us 'til the last five miles of the trip. There were gales, to be sure, but we hung on to sail like grim death so we wouldn't get caught out without food, much of which was spoiled by water.

Men got washed away from the wheel, but not lost, because they were lashed or got tangled up in the life lines. A sea broke a big plank we had lashed between the davits to protect the lifeboats and it was forever tearing away our heavy canvas weather cloth.

A thing I will never forget is one morning when we were tearing along at 13¾ knots with a SSW., gale on the quarter end, believe it or not, the gale shifted to NW., in five seconds! I had to head her south right into the tremendous seas 'til we got all hands on deck to jibe her. Several of the men said they had never been scared before but that they sure were this time. Why she didn't break in two I don't know. It wouldn't have taken us long to get to the bottom, because we were half way there when in the trough of those waves.

We made a good landfall at Bishops Rock and made our number at the Lizard eighteen days nine hours from Brenton Reef. We were nineteen days eight hours to Southampton. Not until the last two days could we stand over thirty seconds without hanging on.

I expect to lecture in London on November 12 and will travel some before and after. Will be back before Christmas.

Yours truly,

(Sgd.) IRVING JOHNSON.

Azimuths from the "Line of Position Book"

The *Line of Position Book* by Weems may be used to compute the azimuth instead of using diagrams if the navigator so desires. An account of the necessary steps together with an explanation appears on page 17 of this issue. For the benefit of those who have the book mentioned, and who would like to paste a copy of this one-page article in its cover, the Institute has had a number of reprints made. One of these will be sent to anyone requesting it if he will enclose a self-addressed envelope with his request.

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